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Remedial Investigation/Feasibility Study
**FINAL FIELD
SAMPLING PLAN**

OCCIDENTAL CHEMICAL CORPORATION

Pottstown, Pennsylvania

November 1990



Engineers, Planners, Scientists
and Laboratory Services

REPORT

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REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FIELD SAMPLING PLAN

FOR

OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

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1.0 INTRODUCTION

1.1 RI/FS PURPOSE AND OBJECTIVES

In 1985, the U.S. Environmental Protection Agency (EPA) Field Investigation Team (FIT) from Region III investigated Occidental Chemical Corporation's (Oxychem) Pottstown, Pennsylvania, site to characterize existing site conditions. Groundwater and sediment samples were collected and analyzed by several laboratories to document any chemicals suspected to be present in the site soils and groundwater based on previous results generated by other studies. As a result of this investigation, the OxyChem site was evaluated by the EPA in 1988 using the Hazard Ranking System. The groundwater score was 79.43 and the site was placed on the National Priority List (NPL) (Number 277). This ranking identified the primary concern at the site to be trichloroethene (TCE), trans-1,2- dichloroethene (trans-1,2-DCE), and vinyl chloride monomer (VCM) in the Brunswick and Lockatong Formations, and alluvial deposits. On January 5, 1989, Region III EPA informed OxyChem that it has been identified as a Potentially Responsible Party (PRP) for contamination at the site and that Oxychem's participation in a Remedial Investigation/Feasibility Study (RI/FS) was requested. Within 14 days, OxyChem responded that it would be willing to participate in a RI/FS at the subject site. BCM Engineers Inc. (BCM) was subsequently retained by Oxychem to develop and implement the RI/FS. On December 28, 1989, a Consent Order (Docket No. II-89-20-DC) was signed between the USEPA and OxyChem.

Chemical impact to groundwater in the bedrock aquifer will be the focus of this RI. The entire site, including the former TCE handling area (Figure 1-1) will be investigated to identify and characterize potential source areas for observed chemical impact to groundwater. Groundwater quality data will also be used to evaluate any chemical impact from the landfills or lagoons. In addition, the RI/FS will emphasize the collection of data necessary to evaluate groundwater migration routes and risks to public health or the environment through a determination of the current distribution of chemicals in groundwater and predictions of chemical transport based on a thorough analysis of the groundwater flow system. Finally, this RI/FS will enable an evaluation of the potential remedial alternatives with emphasis on risk reduction through actions that utilize treatment to permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants.

2.0 SAMPLING OBJECTIVES

2.1 GROUNDWATER SAMPLING OBJECTIVES

Two rounds of groundwater samples will be collected from the monitoring network to meet the following objectives:

- Characterize the types and concentrations of chemical constituents in groundwater beneath the site
- Delineate the vertical and lateral extent of chemical constituents in groundwater beneath the site
- Characterize total groundwater quality for treatment alternatives evaluation and design

2.2 SURFACE WATER SAMPLING OBJECTIVES

Three areas will be investigated for surface water quality: the sediment pond discharge swale; the stormwater sewer outfalls and the Schuylkill River. Surface water samples will be collected and analyzed by a laboratory to characterize water quality. The samples will be collected to meet the following objectives:

- Characterize the types and concentrations of chemicals in the respective waters
- Assess chemical impacts via surface water routes to the Schuylkill River

2.3 SOIL/SEDIMENT SAMPLING OBJECTIVES

The following areas will be investigated for soil and sediment quality: the active lagoon area; stormwater sewer outfalls; borrow area; the Schuylkill River; the main past and present production areas of the plant; the vicinity of the former earthen lagoons; and the vicinity of the active landfill sedimentation pond swale. These areas will be investigated through the use of a soil vapor survey, soil borings and sampling. Soil and sediment samples will be collected to meet the following objectives:

- Identify potential remaining sources of TCE and related volatile organic compounds (VOCs) in plant production area soils

- Characterize the vertical and lateral extent of TCE and related VOCs in plant area soils
- Characterize the types and concentrations of VOCs in the sludge in the inactive earthen lagoons
- Determine the volume of sludge in the former earthen lagoons
- Investigate the types and concentrations of VOCs in soil beneath the inactive earthen lagoons
- Investigate the types and concentrations of VOCs in soil adjacent to the lined lagoons
- Investigate any impact of the active landfill sediment settling basin on the discharge swale sediments and surrounding soil
- Investigate any chemical impact to the soils in the borrow area
- Evaluate the stormwater sewer as a chemical migration pathway
- Characterize background soil quality

3.0 GROUNDWATER INVESTIGATION

3.1 EXISTING BOREHOLE REDEVELOPMENT (TASK 1)

Existing open rock water production well PW-7 will be redeveloped using compressed air. Redevelopment of this well will take place before the other test boreholes are drilled. Redevelopment before drilling allows for any additional drilling to be done in case the existing borehole collapses as a result of development. If borehole collapse occurs, the drilling rig will set up over the hole, if feasible, to drill out the borehole. If drilling out the existing borehole is not feasible, a new boring adjacent to the old will be completed to the original borehole depth.

Before redevelopment of PW-7, the submersible pump and down hole piping will be removed. Each pump house roof will be removed to facilitate pump and pipe extraction. All electricity will be turned off, with all pump wiring disconnected. The pump control panel will be locked off by OxyChem personnel, to prevent the accidental turn on of electric power. Piping will be disconnected from the transfer line to the PVC production area at the surface in the pump house. All electrical switches and breakers will be covered with poly sheeting. Development water will be directed out of the pump house into a tanker truck for transfer to either the PVC sludge clarifier or non-contact cooling water clarifier.

Development will consist of surging compressed air up and down the entire borehole, combined with steady air flow to remove as much residual sediment and organic buildup as possible. Development will continue until water clarity is near sediment free.

At completion of this task, all downhole pumping equipment will remain out of the borehole to facilitate the camera survey, geophysical logging, packer testing and monitoring well construction.

The following information specific to this task will be recorded in a field log book:

1. Health and safety protection level
 - a. Starting level
 - b. Time of up or downgrade
2. Health and safety parameter monitoring concentrations
3. Start time and method of well development
4. Any problems associated with well development

5. Depth of pressure line and approximate flow rate (per 50 foot intervals)
6. Changes in water quality (color, clarity, odor) with time
7. Stop time of well development

3.2 RECONNAISSANCE BOREHOLE DRILLING (TASK 2)

Reconnaissance boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10 and PW-1 will be drilled using air-percussion drilling techniques (down-the-hole-hammer). All boreholes will be 8-inches in diameter to total depth. Figure 3-1 shows the locations of the reconnaissance boreholes.

Compressed air will be used to lift cuttings to the surface. No surfactants will be used in the air stream. If mud collars form around drilling pipe, water will be allowed into the airstream to reduce collar formation.

Existing water production well PW-1 will be drilled deeper, from the present depth of 387 feet to 550 feet. The new length of the borehole will be 8-inches in diameter, which is the same as the lower 187 feet of the existing borehole (10-inch I.D. from 0-to 200 feet). The drilling rig will setup over the existing hole. The pump house will be dismantled prior to drilling, if necessary.

The first drilling task of the RI was drilling of a borehole to a depth of 100 feet at Location TB-3 during the 1990 plant maintenance period. Following drilling, this portion of the borehole was geophysically logged, surveyed with a downhole television camera, and packer tested). Groundwater samples were collected during packer testing for laboratory analysis. Following testing, 100 feet of steel casing was installed into the borehole and grouted to the formation to prevent cross migration of chemicals.

Drilling the remainder of borehole TB-3, the remaining nine test boreholes (TB-1, TB-2 and TB-4 through TB-10) and the deepening and redevelopment of existing wells PW-1 and PW-7, respectively, will be executed according to the Work Plan.

Each borehole will be drilled one at a time in the following order: PW-1, TB-9, TB-4, TB-8, TB-7, TB-10, TB-5, TB-6, TB-2, TB-1 and the remainder of borehole TB-3.

At each location the drill rig will be setup with adequate space to safely maneuver and operate the drill. At each borehole location sediment settling pits will be dug to contain the drill cuttings and formation waters. Section 7.0 describes the construction and use of these sediment pits.

Once set up, the rig will proceed to drill and install the outer protective steel casing. Twenty-foot sections of 8-inch I.D. steel pipe welded together as needed will be grouted into competent bedrock at each borehole location. Actual casing lengths for boreholes TB-1, TB-2 and TB-3 (already installed) will be approximately 100-feet. The remaining test boreholes will have 30 to 40 feet of casing. For these other test boreholes actual casing lengths may vary slightly depending on depth to competent rock at each location or the occurrence of a water bearing zone at the intended casing completion depth. Casing lengths will be increased as needed to assure completion in competent rock.

To install the casings, a 12-inch diameter hole will be drilled to the required casing depth. For boreholes TB-1, TB-2 the borehole will be advanced to about 100-feet below ground surface for performing the camera survey, geophysical logging and packer testing. Once these tests are complete, casings will be installed. Once installed, the casing will be cemented to the formation using a cement grout with 10 percent bentonite pumped into the borehole annulus via a 1-inch I.D. PVC tremie. Casings will be lifted slightly to assure the base is surrounded by cement. Each casing will be allowed to set for a minimum of 12 hours before the borehole is advanced to depth. To complete installation of the 8-inch casing at locations TB-4, TB-8, TB-9 and TB-10 the driller, at his discretion, may install a larger diameter (12-inch) temporary outer steel casing to hold back the saturated alluvium.

After installation of the outer casing, an eight inch borehole will be advanced to the desired depth at each location. Table 3-1 lists the expected completion depths of each borehole. The borehole will be advanced at a reasonable rate to optimize collection of lithologic and hydraulic information such as drilling bit resistance relative to depth, depth of first saturated zone, and formation yield with depth.

Borehole groundwater yield will be measured at intersection of the first saturated zone, with the addition of every one to two drilling rods and at the discretion of the driller and site hydrogeologist depending on visible changes in water flow out of the borehole. Water flow will be measured with a container and stop watch or with a V-notch weir depending on water volume. The V-notch weir will be installed as part of the sediment settling basins and is discussed in Section 7.0.

Completion depths of the respective boreholes will be a saturated zone at, or closest to, the indicated depths in Table 3-1. If the formation is dry at the expected completion depth, the borehole will be advanced up to an additional 50 feet to intersect the next closest saturated zone. If the formation remains dry over this additional distance the borehole will be grouted up to the previously encountered saturated interval closest to the indicated completion depth. A cement grout with 10 percent bentonite will be tremied into the hole through a 1-inch I.D. steel tremie to cement the hole.

One continuous rock core will be collected from the top of bedrock to a depth of 400 feet from borehole location TB-1. Ten foot lengths of rock core will be collected with a NX corebarrel. Potable water will be used to help advance the corebarrel. Each section of core will be described for lithology and fracture geometry by the site hydrogeologist. The entire length of rock core will be archived for safe keeping at a locked storage area at the OxyChem Pottstown plant. The stored cores will be accessible to the EPA and other interested parties through contacting appropriate plant personnel for the duration of the RI/FS..

If, during the course of drilling, any equipment is lost down a borehole, an attempt to recover the equipment will be made. If the equipment cannot be recovered, the hole will be abandoned and grouted to the surface using the previously described method. A new borehole will be drilled as feasibly close to the original as possible, beginning with installation of the outer steel casing and proceeding to the anticipated completion depth.

After each borehole is drilled, development of the borehole using compressed air will proceed until water quality is near sediment free or for 1 hour. The drilling rig or a separate air compressor will supply the air.

Water brought to the surface during drilling or development at boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, and TB-10, PW-1 and PW-7 will be contained at the borehole location and transferred to the onsite wastewater treatment system. Section 7.0 describes the containment and transfer process.

Decontamination of all down hole equipment will be done before the first borehole is drilled and in between each successive borehole at a designated decontamination area on site. All wash water and loose sediment will be contained. Wash water will be sent to the on site wastewater treatment plant if the suspended sediment level allows, other wise it will be contained in 55-gallon Pennsylvania Department of Transportation (PADOT) approved drums for subsequent characterization sampling and disposal. All loose sediment will be contained in 55-gallon drums for characterization sampling and disposal. Section 7.0 describes the decontamination process and the Health and Safety Plan (HASP) describes the health and safety requirements for this task.

The following information specific to this task will be recorded in either a field log book or a boring log (Attachment 3 in QAPP):

Field Book:

1. Health and safety protection level
 - a. Starting level
 - b. Time of up or downgrade
2. Health and safety parameter monitoring concentrations
3. Flow measurements
 - a. Flow rate
 - b. Depth of borehole
 - c. Time of measurement
 - d. Measurement method
4. Drilling characteristics
 - a. Bit resistance
 - b. Depth of increased flow
 - c. Air pressure changes
 - d. Problems during drilling
5. Equipment decontamination time

Rock Core:

1. Lithology Description
2. Fracture Spacing and Characteristics

Boring Log:

1. Lithology description
2. Borehole and monitoring well construction characteristics

3.3 BOREHOLE GEOPHYSICAL LOGGING (TASK 3)

Borehole geophysical logging will be conducted on select boreholes during three phases. The first phase was performed during the plant maintenance period in June and July 1990. The upper 100 feet of test borehole TB-3 and the entire lengths of existing water production wells PW-5, PW-8, PW-9, and PW-10 were tested. The first 100 feet of TB-3 was

geophysically logged before the casing was installed. Geophysical surveys performed included caliper, temperature (linear), and natural gamma ray. Resistivity and conductivity logs require a new borehole to produce the electrical characteristics of the formation which are recorded with this technique. These logs were run on TB-3 only.

The second phase of geophysical logging will take place when the remainder of the reconnaissance boreholes are drilled. Boreholes TB-1 and TB-2 will be tested first to expedite completion of the respective monitoring wells. Boreholes TB-4 through TB-10, PW-1 and PW-7 will be tested afterwards. During the same phase, existing monitoring well BR-2 will be geophysically logged. The third phase of geophysical logging will be performed following the drilling and testing of the additional boreholes for additional monitoring wells.

Geophysical surveys to be performed will include caliper, temperature (linear and differential), natural gamma ray, resistivity and conductivity. Induction logs (resistivity and conductivity) require new boreholes for maximum resolution, therefore these logs will be run on new boreholes drilled for the investigation and not existing ones. Existing production wells to be tested will have the submersible pumps and discharge piping removed from the boreholes prior to testing.

The various geophysical sondes and cable will be cleaned before performing the first survey (borehole) and between each survey. Cleaning will be done at the designated area onsite. The cleaning process is described in Section 4.0 of the QAPP. The HASP describes all safety procedures for this task.

The site hydrogeologist will oversee the survey process and record any significant borehole characteristics noted during the surveys. Listed below are the characteristics specific to this task to be documented in the field log book:

1. Health and safety protection level
 - a. Starting level
 - b. Time of up or down grade
2. Health and safety parameter monitoring concentrations
3. Significant borehole and survey characteristics
4. Equipment decontamination time

3.4 BOREHOLE CAMERA SURVEY (TASK 4)

The camera survey of the reconnaissance boreholes will proceed in the following order. Existing production wells PW-5, PW-8, PW-9, and PW-10 and the upper 100 feet of reconnaissance borehole TB-3 were surveyed during the 1990 plant maintenance period. The production wells were tested after the submersible pumps and piping had been pulled. The remainder of the reconnaissance boreholes (TB-1, TB-2, TB-4 through TB-10, PW-1, PW-7, and the remaining portion of TB-3) will be surveyed when these boreholes are drilled. Boreholes TB-1 and TB-2 will be surveyed first in the same manner as described for TB-3 to expedite outer casing well installation to prevent cross chemical migration, followed by these boreholes in the approximate order indicated: TB-6, TB-5, PW-1, PW-7, TB-10, TB-7, TB-8, TB-4, and TB-9.

One camera survey will be performed for each borehole. A forward viewing color television camera will be lowered down the borehole at a rate that will allow real time observation and logging of borehole characteristics.

The television camera and all downhole cable will be decontaminated before performing the first survey and between each survey. Decontamination will be done at the designated decontamination area. The cleaning process is described in Section 4.0 of the QAPP. The HASP describes all safety procedures for this task.

The site hydrogeologist will log significant borehole characteristics during each survey. In addition to real time observation of each borehole, a Hi-8 video format tape recording will be made from each survey. Listed below are the characteristics specific to this task to be documented in the field log book:

1. Health and safety protection level
 - a. Starting level
 - b. Time of up or downgrade
2. Health and safety parameter monitoring concentrations
3. Borehole characteristics:
 - a. Fracture zone thicknesses and depth from surface
 - b. Individual fracture orientations
 - c. Lithology changes
 - d. Borehole orientation
 - e. Water clarity
4. Equipment decontamination time

3.5 BOREHOLE PACKER TESTING (TASK 5)

Reconnaissance boreholes TB-1, TB-2, the remainder of TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1, and PW-7 will be packer tested following completion of the camera and borehole geophysical surveys. The top 100 feet of test borehole TB-3 was packer tested in July 1990. The top 100 feet will be tested first, followed by the remainder of the borehole after it is drilled. The remaining boreholes will be packer tested after these boreholes are drilled. Boreholes TB-1 and TB-2 will be packer tested first in the same manner as described for TB-3 to expedite well completion, followed by testing of TB-6, TB-5, PW-1, PW-7, TB-10, TB-7, TB-8, TB-4, and TB-9.

The number and length of test intervals will be determined from the camera survey and geophysical log results. Geophysical logs, camera survey tapes, and packer interval selections for each borehole will be delivered to the EPA as a single package. A double-inflatable straddle packer system with a pumping-out format will be used for each interval, beginning with the lowest most fracture zone and proceeding to the surface. The following data will be collected: potential distribution of head in the formation adjacent to the borehole; specific capacity of each tested interval; hydraulic conductivity of the formation adjacent to the borehole; and a groundwater sample from each tested interval for laboratory analysis.

Table 3-2 lists the various equipment to be used in the packer testing process. Two, 6-foot-long nitrogen inflated rubber packers will be used to seal off a particular test interval. The depth resolution of the packer system is approximately 480 feet. If a fracture zone at this depth requires testing, only one packer will be installed no deeper than 480 feet to seal off the interval between the packer and the base of the hole. Three electronic pressure transducers connected to a digital data logger (Hermit 2000) will monitor water level changes below, between and above the packers (one transducer below, between and above). A submersible pump will be placed near the base of the packed off interval to pump water out of the formation. Water will be discharged out of the hole via steel lift pipe with inline flow valve and meter.

The following is a list of tasks to be performed for each test borehole interval:

1. A water elevation will be measured at each borehole before installation of the packers
2. Depending on the depth of the lowest fracture interval to be tested, one or two packers will be lowered to the deepest test interval with the submersible pump appropriately located below the upper packer and a pressure transducer, one each, placed below, between and above each packer.

3. At the proper depth, the packers will be inflated, and a water level measurement will be collected from each transducer and recorded on the data logger
4. The pump will be turned on at a predetermined low flow rate (1 to 2 gpm) simultaneously with the data logger to draw water out of the formation and to automatically record water level changes according to predetermined stepped logging intervals
5. Water level draw down in the test interval will be monitored during pumping to assure the zone is not dewatered and to assess whether an increase in the flow rate is necessary
6. If the flow rate is increased (stepped), it will be done so simultaneously with activation of a new test sequence on the data logger; increases will be on the order of 2 to 3 gpm per step
7. If an interval is dewatered within minutes of pump startup, the data logger will be stopped, a new test programmed, and recovery monitoring initiated at pump shut off.
8. Pumping will continue until the water level in the test interval has stabilized or until the zone is nearly dewatered
9. Time of pump start up, time of flow increase, pumping duration, and time of pump shut off will be recorded
10. Manual water level measurements will be recorded from appropriate observation wells for each interval tested.
11. Prior to pump shut off a water quality sample will be collected from the discharge line
12. Following flow stabilization and sample collection, the pump will be turned off simultaneously with the start of a new test sequence on the data logger to record water level recovery and any associated lower and upper zone water level changes
13. When recovery in the test interval reaches 90 percent of the original level, the data logger will be stopped, the packers will be deflated and moved to the next higher test interval, and the process will be repeated.

Each borehole will be tested in the above manner up to the water bearing fracture zone closest to the surface. The upper most packer will be no higher than the base of the final protective steel casing, for each borehole.

Water generated during the testing of boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1, and PW-7 will be pumped to a standby tanker truck for disposal at the onsite wastewater treatment plant.

After extracting the downhole packer equipment and transducers, this equipment will be decontaminated in the designated cleaning area before placement in another borehole. Section 4.0 of the QAPP describes the cleaning process. The HASP describes all of the safety procedures to be followed during the packer testing task.

The following information specific to the packer testing task will be recorded in the field log book:

1. Health and safety protection level
 - a. Starting level
 - b. Time of up or downgrade
2. Health and safety parameter monitoring concentrations
3. Packer testing characteristics (per test interval)
 - a. Depth of test interval (packer depths)
 - b. Depth of pump
 - c. Depth of pressure transducers
 - d. Start time of pump and data logger
 - e. Flow rate (at start, midpoint, and end of pumping)
 - f. Comments on drawdown rate
 - g. Time of pump shut off if interval dewatered
 - h. Time of groundwater quality sample collection
 - i. Time of pump shutoff
 - j. Water quality

3.6 RECONNAISSANCE BOREHOLE GROUNDWATER SAMPLING (TASK 6)

3.6.1 Sampling Locations and Frequency

One groundwater sample will be collected from each packer tested interval for reconnaissance boreholes TB-1, TB-2, the remainder of TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1 and PW-7. The sample will be collected near the end of the pumping period for each interval to assure it is representative of the formation.

3.6.2 Sample Designation And Task Documentation

Each groundwater sample collected as part of the packer testing process will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the reconnaissance borehole number; the sample matrix; and the depth of the top of the lowest most packer, which will indicate the depth the sample was collected from for a particular test interval. The general format is as follows: site name - test borehole number and sample matrix - lowest packer depth. An example would be: OXY-TB1GW-250. This sample designation will be written on an adhesive label in indelible ink and attached to the sample container with additional information listed in Section 6.0.

The following information specific to the task will be noted in the field log book after the sample is collected:

- Time of sample collection
- Description of sample collection method
- Number and type of sample containers filled

3.6.3 Sampling Equipment and Procedures

The following equipment will be used to bring groundwater to the surface and allow for the collection of a groundwater sample: stainless steel submersible pump; galvanized steel lift pipe; inline stainless steel T-valve; and three 40-milliliter (ml) volatile organic analysis (VOA) vials with teflon septum caps. Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements and required field quality control (QC) samples, respectively.

The groundwater sample from each test interval will be collected at the end of the pumping interval prior to pump shut off. Three 40-ml VOA vials will be filled for one sample per test interval. VOA bottles will be preserved with 1:1 HCl according to the procedure in Section 4.5 of the QAPP. The samples will be filled via the inline valve. The valve will be opened slightly to allow a continuous stream of groundwater to flow out of the discharge pipe and down the side of the VOA vial to overflowing, forming a "convex meniscus" at the vial rim. Each VOA will be filled one at a time and capped with no head space allowed.

Field duplicates analyzed for the same parameters as listed in Section 4.2.1 of the QAPP will be collected for every 20 field samples (5 percent according to the procedure outlined in Section 9.2.3 of the QAPP). A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP.

After extracting the downhole packer equipment and transducers, this equipment will be decontaminated in the designated cleaning area before placement in another borehole. Section 4.0 of the QAPP describes the cleaning process. The HASP describes all of the safety procedures to be followed during the packer testing task.

At each sample interval a separate aliquot of groundwater will be collected for field analysis of Eh, pH, temperature, dissolved oxygen (DO) and specific conductance (EC). These analyses will be performed according to the procedures outlined in Attachment 4 of the QAPP.

3.6.4 Sample Analysis

Section 4.2.1 of the QAPP describes the analyses for this sampling event.

3.7 MONITORING WELL DRILLING AND CONSTRUCTION SPECIFICATIONS (TASK 7)

3.7.1 Reconnaissance Borehole Monitoring Wells

Packer testing results on relative formation permeabilities and groundwater quality will determine the need for, or completion depth of, a monitoring well in boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1 and PW-7. The Interim Report to the EPA will outline the well depths and construction specifications. If analytical results from packer testing a particular borehole indicate that no chemicals are present within the groundwater at that location and no other hydrogeologic information is needed from this area, construction of a monitoring well will not be proposed. A particular unneeded borehole will be grouted to the surface using a cement grout with 10 percent bentonite pumped under pressure into the borehole from the bottom via a tremie. If a monitoring well will be constructed in any of these boreholes at a shallower depth than the existing borehole, the borehole will be grouted to the required completion depth using the same type of cement grout via the method described above. The grout will be allowed to set for a minimum of 12 hours before well construction begins.

To minimize the potential for cross chemical migration at test boreholes TB-1, TB-2, and TB-3, monitoring wells will be completed in these boreholes before submittal of the interim report. EPA approval for completion of these three monitoring wells will be obtained prior to well installation. The remaining boreholes will remain open until completion specifications listed in the Interim Report are approved.

VOC concentrations in the groundwater at each respective borehole location will determine the types of materials used for well construction. Schedule 40 PVC screen and riser will be used to construct the various monitoring wells. If VOC concentrations in groundwater are on the order of several percent or higher then stainless steel (Type 304) continuous slot screens and low carbon black steel riser will be used.

If PVC is used to construct the wells, the following materials specifications and procedures will be followed. Screw-flush, 4-inch nominal schedule 40 PVC riser and screen will be used to construct the wells. Screen slot size will be 0.020-inch. Screen lengths will be determined by the packer testing results. A bottom plug will be placed at the base of the well screen. Screen and riser will be assembled at the borehole and lowered into the borehole as additional sections are added. Centralizers may be used to assure proper alignment of screen and riser within the borehole. One centralizer each will be attached at 100-foot intervals along the length of the riser.

A filter pack will be emplaced around the screen, from the base to 2 to 3 feet above the top of the screen. The filter pack will be sized for consistency with the screen slot size based on the permeability, as determined during packer testing, of that portion of the borehole to be screened. The filter pack will be gravity emplaced into the borehole/well annulus by pouring from the surface. If bridging of the filter material is a problem, the filter will be gravity emplaced via a PVC screw flush tremie, with water added to prevent bridging within the tremie. A nonchemical additive bentonite slurry will be tremied under pressure on top of the sand pack to a thickness of approximately 3 feet. A cement grout with 10 percent bentonite will be tremied under pressure into the borehole annulus from the top of the bentonite seal to the surface. Either a locking protective steel stickup or flushmount cap will be emplaced over the PVC well, with an outward sloping cement cap formed around the locking cover.

If steel is used to construct the wells, the following materials specifications and procedures will be followed. Nominal 4-inch, black steel pipe with threaded flush joints will be used for well riser. Nominal 4-inch continuous slot (0.020-inch) stainless steel (Type 304) screen will be welded to the riser to complete the well. Screen lengths will be determined by the packer testing results for each test borehole. Centralizers, filter pack, bentonite seal, annulus grouting and locking steel cap will be installed the same as the PVC wells.

Well development will be done following installation of each additional monitoring well. A submersible pump will be used wherever feasible. During well development, the following field parameters will be measured and recorded as a means of assessing, via stabilization of readings, that groundwater quality is approaching formation quality: pH, specific conductivity, and temperature. In addition, groundwater turbidity will be monitored visually via clear glass bottle observation.

A minimum of three to five well volumes will be evacuated from the well casing prior to sampling. In addition, the criteria for termination of well development will be as follows:

- i. Development will be conducted for 1 hour unless field parameters indicate stabilization prior to that time.

- ii. Development will not be continued for longer than 1 hour if the field parameters indicate that equilibrium is not achievable.
- iii. If, toward the end of one hour, field parameters appear to be approaching equilibrium (e.g., a marked decrease in turbidity is noted at 50 and 60 minutes), then development will be continued for a few additional monitoring intervals to determine if conditions stabilize.

Analysis for total suspended solids will be performed during the two rounds of monitoring well sampling.

The same contingency for groundwater containment as described for packer testing will be utilized during well development for boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1 and PW-7 unless packer test groundwater samples indicate chemical concentrations are below MCLs. In this case groundwater will be discharged to ground surface.

3.7.2 Additional Monitoring Wells

Detailed construction specifications for additional monitoring wells will be included in the interim report to the EPA. The various potential uses of these additional wells dictates specific construction materials and procedures which can not be determined until the the exact type and use of a particular well is known.

3.7.3 Monitoring Well Installation Documentation

The following information will be recorded in the field log book and on monitoring well completion specification logs (Attachment 3 of QAPP):

Field Log Book:

- 1. Health and safety protection level
 - a. Starting level
 - b. Time of upgrade or downgrade
- 2. Health and safety parameter monitoring concentrations
- 3. Flow measurements (during borehole drilling)
 - a. Flow rate
 - b. Depth of borehole
 - c. Time measured
 - d. Measurement method

4. Drilling characteristics
 - a. Bit resistance
 - b. Depth of increased flow
 - c. Air pressure changes
 - d. Any drilling problems
5. Monitoring well construction materials and time
6. Equipment decontamination time

Monitoring Well Log:

1. Lithology description
2. Monitoring well construction specifications

3.8 MONITORING WELL SURVEY (TASK 8)

Following the drilling of the 10 test boreholes (TB-1 through TB-10) the top of the outer steel casing and the ground surface will be surveyed by a Pennsylvania licensed surveyor for both location and elevation, to serve as a reference point for constructing any groundwater potentiometric surface maps from packer testing results. Existing test boreholes PW-1, and PW-7 have already been located. The boreholes will be located according to the local site coordinate system and converted to the Pennsylvania State Plane Coordinate System. Casing and ground surface elevations will be surveyed relative to a USGS benchmark adjacent to the site.

A second survey will be performed when the final monitoring network wells have been installed. This will include determination of the elevation of the inner well casings for the 12 reconnaissance borehole wells and the location and innercasing, outercasing and ground surface elevations of additional wells. The additional wells will be surveyed for location and elevation the same as described for the test boreholes.

3.9 MONITORING WELL SAMPLING (TASK 9)

3.9.1 Sampling Locations and Frequency

Two rounds of groundwater samples will be collected from the monitoring well network. Table 3-3 provides the list of monitoring wells to be included in the monitoring network. The first round will be collected a minimum of 2 weeks after installation of the last additional monitoring well to assure all new wells have properly equilibrated to the formation. The second round will be collected following evaluation of the quality assured first round analytical results. Round 2 sampling parameters will be approved by the EPA prior to sampling.

3.9.2 Sample Designation And Task Documentation

Each groundwater sample collected during both rounds of groundwater sampling will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the monitoring well number; the sample matrix; and the sampling round number. The general format is as follows: site name - monitoring well number and sample matrix - sampling round. An example would be: OXY-TB1GW-1. In addition to the TB well designation, others will be: PW, OW and BR.

These sample designations will be written on an adhesive label in indelible ink and attached to each sample container, with additional information listed in Section 6.0.

The following information specific to well sampling will be recorded in the field log book or the field sampling data sheet (Attachment 3 of QAPP):

1. Static water level prior to purging
2. Total well depth
3. Calculated well volume
4. Volume purged, purge rate
5. Purging method/equipment
6. Sampler type (if other than specified bailer)
7. Water quality
8. Field parameter measurements
9. Field meter calibrations
10. Health and safety monitoring parameter concentrations

3.9.3 Sampling Equipment and Procedures

Table 3-4 lists the well purging, sampling and decontamination equipment that will be used for both groundwater sampling rounds. Tables 1,2 and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements, and required field QC samples.

Monitoring well groundwater sampling will consist of the following tasks: well purging; well sampling; field parameter analysis; and sampling and purging equipment decontamination.

Well purging will be accomplished by either a centrifugal, or submersible pump, or a large diameter PVC hand bailer, depending on well depth and yield. A submersible pump will be used wherever feasible. Well purging will proceed as follows. Plastic sheeting will be placed on the ground around the well to rest purging equipment on. The pump/hose assembly or bailer used in purging will be lowered into the well 5 to 10 feet below the water surface or shallower where necessary. Purging will "pull" water from the formation, through the well screen and up to the surface, enabling the entire static volume to be removed. The pump/hose will be lowered as needed to compensate for any drawdown. Approximately three to

five well volumes will be removed from each well. An aliquot of water will be collected from each well volume for field determination of Eh, pH, temperature, DO and EC. When two successive EC measurements are within the same order of magnitude, purging will stop. Up to five well volumes will be removed per well according to this procedure. These analyses will be performed according to the procedures outlined in Attachment 4 of the QAPP. Well volumes will be measured via a constant pumping flow rate, graduated container and stop watch. Hand bailed well purge volumes will be measured with a graduated container. If recharge to a well is slow, the well will be dewatered (by either pump or bailer) and allowed to recover. If time permits within the same sampling day, the well will be dewatered an additional one to two times before sampling takes place.

Immediately following the purging and recharge of a well, samples will be collected using a Teflon bottom-fill bailer. Dedicated teflon bailers and nylon line will be used for each well. During bailing, all sample containers will be opened and each bailer volume of water will be distributed into all sampling containers, except that portion for VOC analysis. The VOC sample will be collected from the first bailer as a discrete sample to prevent volatilization losses due to compositing. All samples will be poured into appropriate laboratory-prepared containers specified in Table 2 of the QAPP.

Each VOC sample will be collected in three 40-ml vials with screw caps with a Teflon-silicone septum disk in the cap. VOA bottles will be preserved with 1:1 HCl according to the procedure in Section 4.5 of the QAPP. To prevent volatilization, the sample will be poured down the side of the vial to overflowing, forming a "convex meniscus" at the vial rim. The vial will be sealed, and if air is detected in the vial, it will be reopened and refilled following the same procedure.

Those wells sampled for TCL semi-VOCs will have two 1-liter Boston round amber glass bottles filled to the rim. Four more 1-liter amber glass bottles will be filled for those samples chosen for matrix spike/matrix spike duplicate analyses. These containers will be filled for every 20 field samples with the sample location chosen in the field.

For any metals analyses, samples will be collected as both filtered and unfiltered samples. The filtered sample for metals analysis will be collected in one plastic 1-liter container. After filling, the bottle will be preserved with nitric acid to a pH less than 2. The unfiltered sample will be collected in one plastic 1-liter container and will be fixed after filling with nitric acid to a pH less than 2. The filtered sample will be collected through a stainless steel nitrogen pressure filtration device, with filtering performed at the well site. Bailer fulls as needed will be poured into the filter device and forced under pressure through a new .45 micron cellulose filter directly into an unfixed sample bottle. Mercury will be analyzed on the unfiltered sample only. The sample for cyanide will be unfiltered and will be collected in one plastic 1-liter container fixed with sodium hydroxide to a pH greater than 12.

Those wells sampled for pesticides and PCB analyses will have two 1-liter Boston round amber glass bottles filled to the rim. Four 1-liter bottles will be filled for the matrix spike and matrix spike duplicate sample the same as for the semivolatiles.

Field duplicates analyzed for the same parameters listed in Section 4.2.2 of the QAPP will be collected for every 20 field samples (5 percent according to the procedure outlined in Section 9.2.3 of the QAPP). One of the eight site representative wells will have a duplicate collected for analysis. A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP.

Round 2 groundwater samples will be collected according to the same procedures outlined for Round 1 samples, depending on the analytical parameters.

All purging and sampling equipment and field parameter meters will be decontaminated between each sampled well at the well. Section 4.0 of the QAPP describes the decontamination procedure for each piece of equipment.

3.9.4 Sample Analysis

Section 4.2.2 of the QAPP lists the analyses for this sampling event.

3.10 AQUIFER PUMPING TEST (TASK 10)

3.10.1 Aquifer Test Design

An aquifer pumping test will be conducted to determine the local hydraulic properties of the bedrock aquifer. The aquifer test will be designed around the midsummer plant maintenance period to incorporate the plant water production wells as the pumping test wells. For 1989, all production wells, except for the intermittent pumping of PW-6, were turned off on June 26 and were restarted on July 9.

Current PVC production requires one or more of the following wells to be pumped on a continuous basis: PW-5, PW-6, PW-7 (taken off line for the RI/FS), PW-8, PW-9 and PW-10. These wells, when operated, yield between 30 to 200 gallons per minute (gpm). Wells PW-5, PW-8 and PW-10 are continuously pumped. PW-6 is automatically pumped when an above ground water reservoir is depleted to a certain level. The reservoir provides water for PVC production and other plant purposes. Wells PW-7 and PW-9 provide additional water when PVC production dictates the need.

The above production wells, specific existing and newly installed wells (bedrock and alluvial aquifer) and three existing stream gauges will be monitored for water level changes for the test from the time of plant well shutdown (recovery monitoring) through startup (draw down monitoring). This observation network will be discussed with the EPA prior to executing the test. The plant wells that are being pumped at the beginning of the plant maintenance period will be shut off simultaneously, initiating aquifer recovery monitoring. All of the production wells mentioned above, with the exception of PW-7, will be restarted simultaneously at the end of the plant maintenance period, initiating aquifer drawdown monitoring. Pumping flow rates are preset by the plant as determined according to each wells maximum sustainable yield. Excess water not needed for PVC production will automatically go into a plant surcharge basin and then to the onsite wastewater treatment plant.

The majority of groundwater elevation monitoring will be done electronically to expedite data collection, reduction and analysis. Select bedrock and alluvial aquifer monitoring wells and one of the three stream gauges will be fitted with pressure transducers and connected to the data logging system. As determined by the 1989 aquifer test, pressure transducers cannot be lowered down the production wells. Stilling tubes to pass the transducers through could not be lowered to the water surface. The production wells will be manually measured throughout the test.

Automatic electronic monitoring will begin with plant well shut off and will proceed through plant well startup to the point in time where draw down in the furthest bedrock observation well has reached steady state conditions. Based on the 1989 test, this equilibration period could be about 14 days.

Manual water level measurements will be taken before, during and after plant well shut down and startup. Manual water level monitoring will be done at those strategic test or observation wells where electronic monitoring is not possible (primarily pumping wells), as a backup for failed or incomplete electronic monitoring, and at additional site-wide wells and stream gauges. Manually collected data will be used to construct site-wide potentiometric surface maps for the bedrock and alluvial aquifers under pumping and nonpumping conditions. It will also provide water level reference points for electronic monitoring.

3.10.2 Aquifer Test Observation

3.10.2.1 Aquifer Test Equipment

Table 3-5 lists the principal equipment for the aquifer test observation. All pumping and water disposal equipment preexists at the site as a result of production well design and plant operation. Each production well is directly tied, via piping, to either the on site water reservoir or the PVC manufacturing system. Any unused water is

redirected to a holding basin inside the former tire manufacturing building. The water then flows under gravity to the wastewater treatment plant. The only modification required to this system is the installation of a pump start-stop time recorder to production wells PW-6 and PW-9. If these two production wells are turned off for any reason and then restarted, the time recorders will document the exact stop and start times for data analysis. As a plant procedure, total volume of water pumped per well is recorded per 8-hour shift. This information, combined with pumping times enables calculation of flow rates.

Electronic water level monitoring will be done with In-Situ, Inc. "Hermit" models 1000B (two channel) and 2000 (eight channel) digital data loggers (or equivalent) equipped with pressure transducers rated from 20 to 50 psi depending on the estimated drawdown in the wells to be monitored.

Manual water level elevations will be measured with Slope water level probes and engineer scales. These measurements will be accurate to the nearest 0.1-inch.

3.10.2.2 Aquifer Test Procedure

Data Logger Setup

The number, type and location of data loggers and transducers will be dependent on the selected observation well network. Eight-channel data loggers will be used for wells in close proximity to one another and to the production wells. Two-channel data loggers will be used at observation wells located farther out from the production wells to reduce the length of cable required to connect transducers to the data loggers. Data loggers will be housed in weather proof areas, either existing onsite structures or simply constructed wind breaks. Installation of the pressure transducers and setup of the data loggers will be done prior to shut off of the production wells to assure that the logging system is operating correctly for the start of the test.

Either a 20, 30 or 50 psi transducer will be installed in each observation well, depending on the location of the well in relation to the production well pumping centers. Based on the 1989 5-1/2-day drawdown test, about 16 feet and 10 feet of drawdown were measured in observation wells BR-C and BR-A, respectively. These wells are located in the center of the production well pumping network. A comparison of drawdown in bedrock aquifer wells as measured on two different dates (during plant production well pumping) (Figure 3-3) indicates that bedrock observation wells drawdown about 30 feet in the vicinity of the production wells. Production well pumping in the bedrock aquifer lowers the groundwater potentiometric surface in the central part of the site approximately 60 feet from ground surface (Figure 3-4). Based on this information, the following types of transducers will be placed at the following depths across the site: (1) 50-psi transducers will be set at 70 feet below ground surface (BGS) in wells located in the central

production well pumping area, defined as the area between PW-5, PW-9, BR-15 and PW-6; (2) 30-psi transducers will be set at 50 to 55 feet BGS in other central site bedrock wells over 100 feet from the defined central pumping area; and (3) 20-psi transducers will be set at 15 to 30 feet BGS in wells located near the boundaries of the site. Transducers will be placed at lower depths if, at time of installation, the water level in the well is lower. These transducer depths will be appropriate for the drawdown test as well. Final depths of transducers in any alluvial observation wells will be between 5 to 10 feet below water surface. The transducer attached to the selected stream gauge will be placed within a foot of the river bottom, or closer, if necessary.

Each transducer will be decontaminated according to the procedure outlined in Section 4.0 of the QAPP at the designated onsite location before it is lowered into a well. The transducers will be cleaned following their removal from the respective wells after conclusion of the test.

At each observation well, a depth to water measurement (from inner PVC) and a sounding of the total depth of the well will be collected to determine the elevation of the water in the well and the total height of the water column in the well. This information may guide placement of the transducers in each water column if conditions are different than what is expected based on the above discussion. Each transducer placed in an observation well will be lowered to the desired depth in the standing water column. The relay cable attached to the transducer will be wrapped several times around the well stickup, and secured to the stickup using adhesive tape. The transducer used to monitor the stream gauge will be attached to the stream gauge in a secure manner, using weather resistant adhesive tape. Various length extension relay cables will be used to connect the transducers to the respective data loggers. Connection points between cables will be wrapped with weather resistant adhesive tape. Each transducer relay cable or extension cable to be connected to the data logger will be tagged appropriately with the observation well identification number (e.g., BR-14). This aids in proper identification of the transducer to be connected to the desired channel in the event the transducer is not in sight. Transducers will not be connected to the data loggers until the data loggers are programmed for the test.

Setup of the data loggers will be according to the instructions provided by the manufacturer. Key elements of the setup of the data loggers are provided below and pertain to each data logger used for the tests.

Recovery monitoring will be test 0, which is the first test number assigned by the data loggers. Water level measurements will be collected at 10-minute intervals according to the linear logging mode. A linear mode is appropriate since pumping wells will not be measured. Based on the 1989 test, water level recovery in observation wells is expected to be gradual. For transducer parameter setup, top-of-casing mode will be assigned for groundwater measurement. After assigning the proper entry

for data logger and transducer parameters, each transducer will be connected to the appropriate channel. The starting reference water elevation will be the depth to water from ground surface. A round of depth to water measurements measured from the inner PVC casing and corrected to ground surface will be collected from each of the transducer monitored wells before connecting the transducers to the data loggers. Before starting each data logger, the Read function will be used to compare the water level and head readings of each transducer to the manual measurements. A malfunctioning transducer will be replaced. Data loggers will be started simultaneously approximately one hour before the production wells are turned off.

Test 0 will run through the recovery period and will be terminated prior to production well start up. The stored data in each data logger will be down loaded in the field to a portable computer for transfer to the office.

The drawdown test will be setup and run the same as the recovery test. The same wells monitored for the recovery will be monitored for the drawdown phase. Transducers will remain at the same depths. Data logger and transducer parameters will not change. Data will be collected at ten minute intervals, with starting depth to water measurements corrected to ground surface used as the reference points relative to top-of-casing. A round of manually measured depth to water measurements will be collected before the production wells are turned on to confirm the transducers are reading the correct levels. The drawdown test will be Test 1. All data loggers will be started simultaneously and will run until the most distant observation well has equilibrated to pumping conditions. At completion of the test, the data loggers will be disconnected from the transducers, and downloaded in the office. Transducers will be removed from the wells and decontaminated onsite at the designated area according to the proper procedure.

Manual Water Level Measurements

Three groundwater elevation measurement rounds of all site-wide monitoring wells and stream gauges will be performed before and during the aquifer test. The initial rapid drawdown in production wells will be manually measured at the start of the drawdown test.

Prior to shut down of the production wells (either the day before or the day of shut down) at the beginning of the plant maintenance period, a round of depth to water measurements will be collected from all site-wide monitoring wells, production wells, and stream gauges. Depth to water measurements collected during this round from those observation wells equipped with pressure transducers will be used as the reference depth to water levels for the data loggers for the recovery test.

A second manually measured round of depth to water level measurements will be collected prior to the start up of the production wells (either the day before or the day of start up) at the end of the plant maintenance period. This round will document the static potentiometric surfaces in the bedrock and alluvial aquifers across the site and will provide the reference depth to water levels for the data loggers for the drawdown test.

Production wells PW-5, PW-6, PW-8, PW-9 and PW-10 will be manually measured at the start of production well pumping to document rapid drawdown until drawdown levels off to a steady drop. Based on the 1989 aquifer test, this manual monitoring period should be approximately two hours. The depth to water measurement rate is as follows: every 30 seconds for the first 15 minutes; every 1 minute for the next 15 minutes; every 2 minutes for the next 30 minutes and every 5 minutes for the next 1 hour.

The final manually measured depth to water round of all site-wide wells will be performed at the end of the drawdown test. The exact timing of the measurement round will be determined from the groundwater measurements collected by the data loggers. The round will be measured when the data loggers indicate drawdown in the furthest observation well has slowed to approximately 0.1-inch per hour.

Pumping Flow Rate Measurement

Each production well is equipped with a flow totalizer, which will be used to measure the real time flow rate at each pumping well. A stop watch will be used to time the flow for one minute, with flow rates recorded in gallons per minute (gpm).

The flow rates of those production wells pumping at the start of the plant maintenance period will be measured before the pumps are turned off. Production well flow rates will be measured when the wells are turned back on at the end of the plant maintenance period. The first flow rate measurement for each well will be collected approximately 15 minutes into pumping when water level measurements are spaced farther apart. Flow rates will be measured every successive 30 minutes following the first measurement during the manual water level monitoring period. The flow rates will be measured once every 2 days for the remainder of the test, with a final flow rate measurement coinciding with the final manual depth to water level measurement round.

The following information will be recorded in the field log book during execution of the aquifer test:

1. Site-wide manually measured water elevation rounds, date and time

2. Recovery and drawdown test start times:

- a. Transducer depths
- b. Data logger reference water levels
- c. Data logger parameters
- d. Transducer/channel arrangement per monitoring well
- e. Ending pumping flow rates
- f. Manual water level measurements of production wells during drawdown
- g. Production well flow rates during drawdown

3.10.3 Aquifer Test Data Analysis

The Well Hydraulics Interpretation Program (WHIP) has been considered as a possible aquifer test analytical program for the RI/FS because of its application with multiple pumping well situations. Other aquifer test analytical programs may be considered. Consideration will be given to using the approach developed by Javandel and Tsang in their paper "Capture-Zone Type Curves: Tool for Aquifer Cleanup." The Sandia Waste Isolation Flow and Transport Model (SWIFT III) and Geotron's FRACFLOW will also be considered as potentially applicable models once the RI data is collected and remediation programs are conceptualized. Specific justification and rationale for using the selected aquifer test analytical program will be provided in the RI report.

3.11 AQUIFER PUMPING TEST GROUNDWATER SAMPLING (TASK 11)

3.11.1 Sampling Locations And Frequency

Three sets of time-series samples will be collected throughout the course of the aquifer test from production well PW-8. One set will be collected three to four hours prior to turning on the pump at the end of the plant maintenance period. Another set will be collected just after the pump is turned on. The last set will be collected after drawdown in the furthest observation well has stabilized.

3.11.2 Sample Designation And Task Documentation

Each groundwater sample collected will be assigned a sample designation according to a predetermined system. The sample designation includes the following information in an abbreviated form: the site name; the task name, in this case aquifer test (AT); the production well number; the sample media; and the sample number. The general format is as follows: site name - task name - production well number, sample media - sample number. An example is: OXY-AT-PW8GW-1. These sample designations will be written on adhesive labels in indelible ink along with additional information listed in Section 5.0 of the QAPP.

The following information will be recorded in the field log book:

1. Date and time of sample collection
2. Type and number of sample containers filled
3. Description of sampling method

3.11.3 Sampling Equipment And Procedures

Existing production well PW-8 is equipped with a submersible pump, black steel uptake pipe and a sample port in the pump house. A bailer will not pass through the well annulus to the water surface. Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements, and required field QC samples, respectively.

All sample containers will be filled via the sample port in the discharge line. The sample port valve will be opened slightly to allow a continuous stream of groundwater to flow out of the discharge pipe. The three volatile samples will be filled first, one at a time in 40-ml vials with teflon lined plastic caps. To prevent volatilization, the sample will be poured down the side of the vial to overflowing, forming a "convex meniscus" at the vial rim. The vial will be sealed, and if air is detected in the vial, it will be reopened and refilled following the same procedure. VOA vials will be preserved with 1:1 HCl according to the procedure in Section 4.5 of the QAPP.

The sample for select metals analyses will be collected in an intermediate glass jar then poured into a filtering device. The filtered sample will be collected through a stainless steel nitrogen pressure filtration device, with filtration done near the well site. The sample will be forced through a new 0.45-micron cellulose filter directly into one plastic 1-liter sample bottle. After filling, the bottle will be fixed with nitric acid to a pH less than 2.

The remainder of the bottles will be filled to the top and capped. The TSS, TDS, and group alkalinity sample will be collected in one plastic 1-liter container. The COD and TOC sample will be collected in one plastic 1-liter container fixed with sulfuric acid to a pH less than 2.

After the samples are collected, adhesive identification label will be adhered to each bottle. The samples will then be placed in an iced cooler as described in Section 5.0 of the QAPP.

One field duplicate, analyzed for the same parameters listed in Section 4.3.1 of the QAPP, will be collected during one of the three sampling events according to the procedure outlined in Section 9.2.3 of the QAPP. A field rinseate blank will be collected in sample containers identical to field samples each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP.

Analysis for Eh, pH, DO, EC, and temperature will be done in the field according to analytical methods provided in Attachment 4 of the QAPP.

3.11.4 Sample Analysis

Section 4.2.3 of the QAPP describes the sample analyses.

4.0 SURFACE WATER

4.1 SEDIMENT POND DISCHARGE SWALE SURFACE WATER SAMPLING (TASK 12)

4.1.1 Sampling Locations and Frequency

Three surface water samples will be collected from the sediment pond discharge swale to investigate the presence of VOCs in swale surface water. One sample each will be collected adjacent to the sediment pond spillway, at the midpoint of the swale, and adjacent to the Schuylkill River (Figure 4-1).

4.1.2 Sample Designation and Task Documentation

Each surface water sample collected will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location (for all surface water samples it will be the swale (SW)); the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. An example would be: OXY-SW-1-SW.

These sample designations will be written on an adhesive label in indelible ink and attached to each sample container with additional information listed in Section 5.0 of the QAPP.

The following sample information will be recorded in the field log book:

1. Sample location
2. Date and time of sample collection
3. Types and number of sample containers filled
4. Description of sampling method
5. Water quality description

4.1.3 Sampling Equipment and Procedures

All surface water samples will be collected in the specified sample container, with no intermediate sampling equipment used. Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements, and required field QC samples, respectively.

All surface water grab samples will be collected by submerging the sample containers just below the water surface. Containers will be oriented with the open end upstream. Three 40-ml VOA vials will be filled for the VOC sample. VOA vials will be fixed with 1:1 HCl according to the procedure outlined in Section 4.5 of the QAPP. Care will be taken to avoid agitation of the water during filling of the containers. The VOA

vials will be filled to overflowing, forming a "convex meniscus" at the vial rim. Vials will be capped and sealed with no air space. The TSS sample will be collected in one plastic 1-liter container. The total organic carbon (TOC) sample will be collected in one plastic 1-liter container fixed with H_2SO_4 to a pH less than 2. Collection of the samples will be attempted from the swale bank. If the swale must be entered, sample personnel will stand down stream of the containers to avoid collecting disturbed sediment in the sample.

One field duplicate, analyzed for the same parameters listed in Section 4.3.1 of the QAPP, will be collected at one of the three surface water sampling locations according to the procedure outlined in Section 9.2.3 of the QAPP. Samples will be collected in containers identical to field samples.

A field rinsate blank will be collected in sample containers identical to field samples each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP.

There is no sampling equipment related to this field task which requires decontamination.

4.1.4 Sample Analysis

A separate aliquot of water will be collected from each surface water sample location for field analysis of: temperature, pH, Eh, DO, and specific conductance.

Section 4.3.1 of the QAPP describes the sample analyses.

4.2 STORMWATER SEWER OUTFALL SURFACE WATER SAMPLING (TASK 13)

4.2.1 Sampling Locations and Frequency

One surface water sample will be collected from the northern stormwater sewer outfall and the closed landfill stormwater sewer outfall (Figure 4.2). Each sample will be collected from a location immediately inside the concrete pipes. Sample collection will coincide with a rainfall event.

4.2.2 Sample Designation and Task Documentation

Each surface water sample collected will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location (either northern sewer outfall (NSO), or closed landfill sewer outfall (CLSO)), the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. An example would be: OXY-NSO-1-SW.

These sample designations will be written on an adhesive label in indelible ink and attached to each sample container with additional information listed in Section 5.0 of the QAPP.

The following sample information will be recorded in the field log book:

1. Sample location
2. Date and time of sample collection
3. Types and number of sample containers filled
4. Description of sampling method
5. Water quality description

4.2.3 Sampling Equipment and Procedures

All surface water samples will be collected in the specified sample container, with no intermediate sampling equipment used. Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements, and required field QC samples, respectively.

All surface water grab samples will be collected by submerging the sample containers just below the water surface. Containers will be oriented with the open end upstream. Three 40-ml VOA vials will be filled for the VOC sample. VOA vials will be fixed with 1:1 HCl according to the procedure outlined in Section 4.5 of the QAPP. Care will be taken to avoid agitation of the water during filling of the containers. The VOA vials will be capped and sealed with no air space. The semi-VOC sample will be collected in two, Boston round, 1-liter, amber glass bottles. Four more 1-liter amber glass bottles will be filled for those samples chosen for matrix spike/matrix spike duplicate analyses. These containers will be filled at one of the two locations, as determined in the field. For metals analyses, samples will be collected as both filtered and unfiltered samples. The filtered sample for metals analysis will be collected in a plastic 1-liter container. After filling, the bottle will be preserved with nitric acid to a pH less than 2. The filtered sample will be collected in a plastic 1-liter container and will be fixed after filling with nitric acid to a pH less than 2. The filtered sample will be collected through a stainless steel nitrogen pressure filtration device, with filtering performed at the well site. Bailer fulls as needed will be poured into the filter device and forced under pressure through a new .45 micron cellulose filter directly into an unfixed sample bottle. Mercury will be analyzed on the unfiltered sample only. The TSS sample will be collected in one plastic, 1-liter container. The TOC sample will be collected in one plastic 1-liter container fixed with H₂SO₄ to a pH less than 2.

One field duplicate, analyzed for the same parameters as listed in Section 4.3.2 of the QAPP, will be collected at one of the outfalls according to the procedure outlined in Section 9.2.3 of the QAPP. Samples will be collected in containers identical to field samples.

A field rinsate blank will be collected in sample containers identical to field samples each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP.

There is no sampling equipment related to this field task which requires decontamination.

4.2.4 Sample Analysis

A separate aliquot of water will be collected from each surface water sample location for field analysis of: temperature, pH, Eh, DO and specific conductance.

Section 4.3.2 of the QAPP describes the sample analyses for this event.

4.3 SCHUYLKILL RIVER SURFACE WATER SAMPLING

4.3.1 Sampling Locations and Frequency

Twelve surface water samples will be collected during one sampling event from the Schuylkill River to investigate any impacts from the site to the river. Four transects perpendicular to flow, at four separate locations across the river will be sampled (Figure 4-3). Three locations will be sampled per transect (both shorelines and the midpoint).

4.3.2 Sample Designation and Task Documentation

Each surface water sample collected will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location [Schuylkill River (SR)]; the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. An example would be: OXY-SR-1-SW.

These sample designations will be written on an adhesive label in indelible ink and attached to each sample container with additional information listed in Section 5.0 of the QAPP.

The following sample information will be recorded in the field log book:

1. Sample location
2. Date and time of sample collection
3. Types and number of sample containers filled
4. Description of sampling method
5. Water quality description
6. Water quality parameter measurements

4.3.3 Sampling Equipment and Procedures

All surface water samples will be collected in the specified sample containers, with no intermediate sampling equipment used. Tables 1, 2, and 3A of the QAPP list the number of sampling events, the analytical methods and sample bottle requirements, and required field QC samples, respectively.

All surface water grab samples will be collected by submerging the sample containers just below the water surface. Containers will be oriented with the open end upstream. Three 40-ml VOA vials will be filled for the VOC sample. VOA vials will be fixed with 1:1 HCl according to the procedure outlined in Section 4.5 of the QAPP. Care will be taken to avoid agitation of the water during filling of the containers. The VOA vials will be capped and sealed with no air space. The semi-VOC sample will be collected in two, Boston round, 1-liter, amber glass bottles. Four more 1-liter amber glass bottles will be filled for those samples chosen for matrix spike/matrix spike duplicate analyses. These containers will be filled at one of the two locations, as determined in the field. For metals analyses, only an unfiltered sample will be collected. The unfiltered sample will be collected in a plastic 1-liter container and will be fixed after filling with nitric acid to a pH less than 2. The TSS sample will be collected in one plastic, 1-liter container. The TOC sample will be collected in one plastic 1-liter container fixed with H_2SO_4 to a pH less than 2.

Two field duplicates, analyzed for the same parameters as listed in Section 4.3.3 of the QAPP, will be collected at one of the locations according to the procedure outlined in Section 9.2.3 of the QAPP. Samples will be collected in containers identical to field samples.

A field rinsate blank will be collected in sample containers identical to field samples each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP.

There is no sampling equipment related to this field task which requires decontamination.

4.3.4 Sample Analysis

A separate aliquot of water will be collected from the field sample location for field analysis of the following parameters: temperature, Eh, pH, DO and specific conductance. Section 4.3.3 of the QAPP describes the sample analyses.

5.0 SOILS AND SEDIMENTS

5.1 PLANT AREA SOIL VAPOR SURVEY (SVS) (TASK 14)

5.1.1 Survey Design

The soil vapor survey (SVS) will be conducted across present or former main production areas of the site. The survey will target TCE and Trans-1,2-DCE as the key compounds. The survey is intended for source area delineation: therefore, sample points will be 4 to 5 feet below ground surface depending on the following: depth of the soil; the depth at which a sustained air flow can be maintained; the presence of an asphalt or concrete cover; and the presence of rocks or other objects which impede penetration. Soil vapor sampling points will be established according to a grid with approximate 150-foot centers (Figure 5-1). A denser 100-foot separation between sampling points will be used around the former TCE railroad tank car siding and the present PVC sludge clarifier. Each sample point (60 total) will establish soil quality at the respective locations.

After completing the initial survey grid, more comprehensive surveying will be conducted to determine the lateral extent and vertical trends of soil vapor concentrations in areas of potential concern. Additional sampling points, as determined by real time analytical results, will be taken to accurately delineate the presence of TCE and trans-1,2-DCE around initial sampling points where TCE or trans-1,2-DCE are detected at concentrations exceeding 5 ppm. To confirm a soil VOC source versus a groundwater source, depth discrete samples (profiling) will be collected where appropriate. If an area is found to have been affected by these volatile compounds, then potential sources will be examined, with consideration given to past manufacturing processes and present features such as pipes, valves and tanks.

Sample points in the initial survey grid will be numbered consecutively, starting with the first sample point, in the following format: 1-1, 1-2, 1-3, etc. Additional points as determined by real time results will be numbered consecutively in the following format: 2-1, 2-2, 2-3, etc.

5.1.2 Sampling Equipment And Procedures

Table 5-1 lists the equipment that will be used in performing the SVS. Figure 5-2 illustrates the typical setup and execution of a sample point. At each sample location a hardened steel sample probe with drive cap and removable drive point will be driven into the ground to the desired depth using a rotary hammer drill. A 5-foot-long probe will be driven 4 to 5 feet into the ground. To sample through asphalt or cement, the rotary hammer drill will be used to drill a 1-inch diameter hole through either material. After the sample probe is driven to the desired depth, it will be lifted 4 to 5 inches, leaving the disposable steel well point in the ground and exposing the open end of the probe. The above

ground end of the probe is then fitted with a swagelok reducer onto which a section (1-foot) of silicon tubing is connected. The other end of the tube is connected to a vacuum pump capable of extracting one liter of soil vapor per minute. Each sample probe will have three to five probe volumes (20 to 30 second evacuation time) removed prior to sampling. The vapor sample will be collected through a sample port in the silicon tubing, using a gas-tight glass syringe. The sample will be injected immediately into a field gas chromatograph (GC).

Between each sample location, the inside of the sample probes are rinsed with deionized water and allowed to dry before reuse. Several vapor probes allow continuous sampling while used probes are cleaned and dried.

Vapor samples will be analyzed in the field using the portable field GC. At the start of each sampling day, the GC will be calibrated to TCE and trans-1,2-DCE, using standards prepared in the field. Both standards will be prepared at a concentration of 500 ppb. Standards will be analyzed, at a minimum, at the start of sampling (this initially sets up the GC to recognize both compounds), at the midpoint of sampling, and at the end of the sampling day to assure the accuracy and precision of compound peak identification and concentration determination. A duplicate sample will be analyzed for every 10 field vapor samples to assure sampling technique reproducibility. A syringe blank (ambient air) and column blank (carrier gas, ultra zero air) will be analyzed every 10 field vapor samples, to assure that no residual syringe contamination exists.

The following information will be recorded in the field log book during execution of the SVS:

1. Standard Data:
 - a. Concentration
 - b. Injection volume
 - c. Gain amplitude
 - d. Flow rate
2. Vapor sample data
 - a. Sample number
 - b. Injection volume
 - c. Gain amplitude
 - d. Flow rate
 - e. Sample time

5.2 CONTINGENT SOIL BORING PROGRAM (TASK 15)

5.2.1 Sampling Locations and Frequency

Boring locations, quantity of samples, and sample intervals will be determined based on the results of the SVS. One boring will be drilled per identified source area. Three soil samples are anticipated to be collected from each boring. The sampling program will be executed in one round. If analytical results from soil samples from any of the contingent soil borings in identified volatile source areas are uncertain or conflicting, a boring will be drilled adjacent to the original boring and sampled at the same depth interval(s). If a source is determined, additional soil borings for soils sampling will be drilled to determine the lateral extent of the source area(s). The number of borings and the number of soil samples and sample depths will be reviewed with the EPA site representative prior to any further sampling.

5.2.2 Sample Designation And Task Documentation

Each soil sample collected during execution of the soil boring program will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following information in an abbreviated form: the site name; the test boring number (TB__); the sample media; and the depth interval. The general format is as follows: site name - test boring number, sample media - depth interval. An example would be: OXY-TB1S-1.5.

These sample designations will be written on an adhesive identification tag in indelible ink and attached to each sample container with additional information listed in Section 5.0 of the QAPP.

The following information specific to the task will be recorded in either the field log book or a boring log during the sampling effort:

1. Health and safety protection
 - a. Starting level
 - b. Time of up or downgrade
2. Health and safety monitoring parameter information
3. Sample collection information
 - a. Time of split-barrel sampling
 - b. Depth of soil sample
 - c. Depth interval of chemical sample collected
 - d. Soil organic vapor concentration
4. Lithology description
5. Borehole completion specifications

5.2.3 Sampling Equipment And Procedures

Table 5-2 lists the general equipment to be used for the soil boring and sampling task. All drilling will be done with a rotary drilling rig equipped with 4.25-inch hollow stem augers. Soil samples will be collected with 2-inch and 3-inch outside diameter (O.D.) split-barrel samplers. Soil samples for chemical analysis will be collected from the split barrel samplers with a stainless steel sampling trowel.

Soil samples will be collected in the following manner. Continuous split-barrel samples will be collected according to ASTM method D-1586. It is anticipated that samples will be collected from the following intervals 1.5 to 3.0 feet, 4.0 to 6.0 feet and above the weathered bedrock contact. The top 2 feet of soil will be sampled directly by the 2-inch O.D. split-barrel sampler. Each successive sample will be collected after advancing the auger a maximum of 2 feet, with each sample collected from undisturbed soil directly beneath the auger. The split-barrel sampler will be removed from the hole and opened to reveal the sample. After the sample is opened, the site hydrogeologist will split the sample perpendicular to its total length for sample logging and for monitoring any soil pore space vapors with a total organic vapor analyzer (Hnu). The volatile samples will be collected as soon after the sampler is opened. Three 40-ml VOA vials will be packed with soil to the vial rim, capped and sealed. Samples for TOC analysis will be collected in one 16-ounce, tall, wide-mouth glass bottles. The sample for grain size analysis will be collected in one 32-ounce, tall wide-mouth glass bottle. Samples will be collected from the basal 6-inches of the sampler. Soil will be packed into the appropriate sample bottle repository container, capped, labeled and placed in a chilled cooler. Where duplicate samples are required a 3-inch O.D. split-barrel sampler will be used.

Field duplicates, analyzed for the same parameters as listed in Section 4.4.2 of the QAPP, will be collected for every 20 field samples (5 percent) according to the procedure outlined in Section 9.2.3 of the QAPP. Samples will be collected in sample containers identical to field samples.

A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP. Field rinsate and trip blanks will be collected or contained in sample containers identical to field samples.

Sample custody and sample handling are discussed in Section 5.0 of the QAPP.

5.2.4 Sample Analysis

Section 4.4.2 of the QAPP describes the sample analyses.

5.3 INACTIVE EARTHEN LAGOONS SAMPLING (TASK 16)

Inactive earthen lagoon sampling locations and frequencies, sample designation, sampling equipment and procedures, and sample analyses, are described in the Sampling Plan for Inactive Earthen Lagoons, May 1990.

5.4 LINED LAGOONS SAMPLING (TASK 17)

5.4.1 Sampling Locations and Frequency

Ten soil samples will be collected from five borings located around the lined lagoons to investigate potential chemical impact from the lagoons on local soils (Figure 5.4). Each boring will be advanced to the water table. Two samples will be collected per boring, from the 2- to 4-foot depth interval and the 2-foot interval immediately above groundwater. Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements and required field quality control QC samples, respectively.

5.4.2 Sample Designation and Task Documentation

Each soil sample collected as part of the lined lagoon sampling task will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location (in this case the lined lagoons (LL)) and boring number; the sample media; and the sample depth interval. The general format is as follows: site name - sample location and boring number, sample media - sample depth. An example would be: OXY-LL1S-4.0.

These sample designations will be written on an adhesive label in indelible ink and attached to each sample container along with additional information listed in Section 5.0 of the QAPP.

The following information specific to the task will be recorded in the field log book or a boring log:

1. Health and safety protection
 - a. Starting level
 - b. Time of up or downgrade
2. Health and safety monitoring parameter information
3. Sample information
 - a. Time of split-barrel sample collection
 - b. Depth of the split-barrel sample collection

- c. Time of chemical sample collection
- d. chemical sample depth interval
- e. Soil organic vapor concentrations

5.4.3 Sampling and Equipment Procedures

Table 5.3 lists the boring and sampling equipment to be used during sampling. An all-terrain rotary drilling rig equipped with 4.25-inch hollow-stem augers will be used to advance the borings. Two-inch and three-inch inside diameter (I.D.) split-barrel samplers will be used to collect the soil samples.

Continuous (two-foot interval) soil samples will be collected with the two-inch I.D. split-spoon according to ASTM Method D-1586. The three-inch split-spoon will be used for that interval where a duplicate sample is required. The top two feet of soil will be sampled directly with the two-inch split-spoon. For each successive sample, the auger will be advanced a maximum of two feet, with the split-barrel sampler advanced into undisturbed soil below the auger.

The split-spoon will be removed from the borehole, opened, and split perpendicular to its total length. The sample will be scanned with an HNu and logged by the site hydrogeologist. Samples for chemical analysis will be collected as soon after the split-spoon is opened, as is feasible. The sample will be transferred directly from the split-barrel sampler via a stainless steel sampling trowel to the appropriate sample bottle repository container. Dedicated sampling trowels per interval will be used. The container will be labeled and placed into an iced cooler.

All downhole boring equipment will be decontaminated between borings at the designated area onsite. The decontamination procedure is described in Section 4.0 of the QAPP. Dedicated sampling trowels will be used per sample interval. At the end of sampling, each boring will be pressure-grouted to the surface via a tremie, using a cement grout with 10 percent bentonite.

The following sample containers will be filled for the following analyses. Soil samples for TCL VOC analysis will be collected in three 40-ml VOA vials. Soil samples for TCL semi-VOC analysis will be collected in one, 32-ounce, wide-mouth, glass bottle. Soil samples for TAL inorganics analysis will be collected in one, 32-ounce, wide-mouth glass bottle. The soil sample for TOC analysis will be collected in one 16-ounce wide-mouth glass bottle. The portion of sample for grain size analysis will be collected in one 32-ounce, wide-mouth, glass bottle.

Field duplicates, analyzed for the same parameters as listed in Section 4.4.4 of the QAPP, will be collected for every 20 field samples (5 percent) according to the procedure outlined in Section 9.2.3 of the QAPP. Samples will be collected in sample containers identical to field sample containers.

A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP. Associated blanks will be collected or contained in sample containers identical to field sample containers.

5.4.4 Sample Analysis

Section 4.4.4 of the QAPP describes the sample analyses.

5.5 SWALE SEDIMENT SAMPLING (TASK 18)

5.5.1 Sampling Locations And Frequency

Six sediment samples will be collected from the swale near the pond and at representative intervals (approximately 200 feet) along the distance of the swale (Figure 4-1). One sediment sample will be collected from within the sediment pond. Three sediment/soil samples will be collected at the base of the pond.

5.5.2 Sample Designation And Task Documentation

Each sediment sample collected as part of the swale sampling task will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location, in this case the swale (SW); the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. Examples would be: OXY-SW-1-SED or OXY-SW-1-SOL.

These sample designations will be written on an adhesive label in indelible ink and adhered to the sample container with additional information listed in Section 5.0 of the QAPP.

The following information specific to the task will be recorded in the field log book during the swale sampling phase:

1. Sample location
2. Date and time of sample location
3. Types and number of sample containers filled
4. Description of sampling method

5.5.3 Sampling Equipment And Procedures

Sediment sampling equipment will be limited to stainless steel hand augers and sampling trowels. Where possible, sediment samples will be collected with the sampling trowel to minimize sample agitation. Dedicated sampling trowels will be used per sample location. Tables 1, 2, and 3A of the QAPP, list the number of samples per sampling event, the analytical methods and sample bottle requirements and required field QC samples, respectively.

Effort will be made to collect the six sediment samples along the swale from above the water line, but below any embankment. These samples will be collected directly with a stainless steel sampling trowel from 6 inches below the sediment surface. The three samples below the sediment pond will be collected directly with a stainless steel sampling trowel from 6 inches beneath the surface. The sediment sample from within the pond will be collected with a stainless steel hand auger. Sampling personnel will collect the sample from the bank of the pond. After removing the auger bucket from the base of the pond, the sample will be removed from the auger and placed in the appropriate sample bottle repository container using a sampling trowel. Those samples for VOC analysis will be collected in three 40-ml VOA vials. The sample for TOC analysis will be collected in one 16-ounce, wide-mouth, glass bottle. The sample portion for TAL inorganics will be collected in a 32-ounce, wide-mouth, glass bottle. The sample portion for TCL semi-VOC analysis will be collected in one 32-ounce, wide-mouth, glass bottle. The grain size analysis sample will be collected in one 32-ounce, wide-mouth glass container.

One field duplicate, analyzed for the same parameters as listed in Section 4.4.5 of the QAPP, will be collected for this sampling event according to the procedure outlined in Section 9.2.3 of the QAPP. The duplicate will be collected in a sample container identical to the field sample containers.

A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP. Field rinsate and trip blanks will be collected or contained in sample containers identical to field sample containers.

Sample trowels and hand augers not dedicated will be decontaminated between sample stations at the sample station to expedite sampling.

5.5.4 Sample Analysis

Section 4.4.5 of the QAPP describes the sample analyses. Color will be noted for each sample. In addition, a representative sample will be taken from each sampling location and slurried in the field, upon which measurements of the following parameters will be made of the resulting leachate: pH/Eh, specific conductance, temperature, and dissolved oxygen. Laboratory measurement of pH will also be conducted.

5.6 BORROW AREA SAMPLING (TASK 19)

5.6.1 Sampling Locations and Frequency

Three surface soil samples will be collected from the borrow area located in the flood plain to investigate chemical impact from the adjacent lagoons (Figure 5.5). One sample will be collected per location, from the 0-to 6-inch interval.

5.6.2 Sample Designation and Task Documentation

Each sediment sample collected as part of the borrow area sampling task will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location; in this case the borrow (B); the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. An example would be: OXY-B-1-SED

These sample designations will be written on an adhesive label in indelible ink and adhered to the sample container with additional information listed in Section 5.0 of the QAPP.

The following information specific to the task will be recorded in the field log book during the swale sampling phase:

1. Sample location
2. Date and time of sample location
3. Types and number of sample containers filled
4. Description of sampling method

5.6.3 Sampling Equipment and Procedures

Sediment sampling equipment will be limited to stainless steel hand augers and sampling trowels. Where possible, sediment samples will be collected with the sampling trowel to minimize sample agitation. Dedicated sampling trowels will be used per sample location. Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements, and required field QC samples, respectively.

Effort will be made to collect the three sediment samples from 0-to 6-inches below the sediment surface. Those samples for VOC analysis will be collected in three 40-ml VOA vials. That portion of the sample for semi-VOC analysis will be collected in one 32-ounce, wide-mouth, glass bottle. The sample for TOC analysis will be collected in one 16-ounce, wide-mouth glass bottle. The grain size analysis sample will be collected in one 32-ounce wide-mouth glass container.

One field duplicate, analyzed for the same parameters as listed in Section 4.4.6 of the QAPP, will be collected for this sampling event according to the procedure outlined in Section 9.2.3 of the QAPP. The duplicate will be collected in a sample container identical to the field sample containers.

A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP. Field rinsate and trip blanks will be collected or contained in sample containers identical to field sample containers.

5.6.4 Sample Analysis

Section 4.4.6 of the QAPP describes sample analyses. Color will be noted for each sample. In addition, a representative sample will be taken from each sampling location and slurried in the field, upon which measurements of the following parameters will be made of the resulting leachate: pH/Eh, specific conductance, temperature, and dissolved oxygen. Laboratory measurement of pH will also be conducted.

5.7 BACKGROUND SOIL SAMPLING (TASK 20)

5.7.1 Sampling Locations and Frequency

Two background soil samples will be collected from the site and three background soil samples will be collected from offsite. One sample will be collected from the flood plain and the other will be collected from an undisturbed location on the plant grounds. The three offsite samples will be collected from undisturbed areas where public access is allowed or is readily obtainable. Sample locations will be chosen in the field with EPA onsite representative approval. Both samples will be collected from the 0-to 6-inch depth interval.

5.7.2 Sample Designation and Task Documentation

Each soil sample collected as part of the background sampling task will be assigned a sample designation according to the predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location, (in this case the floodplain (FBG) the plant (PBG) and offsite (OS); the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. Example sample designations will be: OXY-FBG-1-S, OXY-PBG-1-S, or OXY-OS-1-S.

These sample designations will be written on an adhesive label in indelible ink and adhered to the sample container with additional information listed in Section 5.0 of the QAPP.

The following information specific to the task will be recorded in the field log book during the swale sampling phase:

1. Sample location
2. Date and time of sample location
3. Types and number of sample containers filled
4. Description of sampling method

5.7.3 Sampling Equipment and Procedures

Soil sampling equipment will be limited to stainless steel hand augers and sampling trowels. Where possible, soil samples will be collected with the sampling trowel to minimize sample agitation. Dedicated sampling trowels will be used per sample location. Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements and required field QC samples, respectively.

Effort will be made to collect the two soil samples directly with a stainless steel sampling trowel from 0-to 6-inches below the soil surface. Those samples for VOC analysis will be collected in three 40-ml VOA vials. That sample portion for TCL semi-VOCs and pesticides/PCBs will be collected in one, 32-ounce, wide-mouth, glass bottle. That sample portion for TAL inorganics will be collected in one 32-ounce, wide-mouth, glass bottle. The sample for TOC analysis will be collected in one 16-ounce wide-mouth glass bottle. The grain size analysis sample will be collected in one 32-ounce, wide-mouth, glass container.

One field duplicate, analyzed for the same parameters as listed in Section 4.4.7 of the QAPP, will be collected for this sampling event according to the procedure outlined in Section 9.2.3 of the QAPP. The duplicate will be collected in a sample container identical to the field sample containers.

A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP. Field rinsate and trip blanks will be collected or contained in sample containers identical to field sample containers.

5.7.4 Sample Analysis

Section 4.4.7 of the QAPP describes the sample analyses. Color will be noted for each sample. In addition, a representative sample will be taken from each sampling location and slurried in the field, upon which measurements of the following parameters will be made of the resulting leachate: pH/Eh, specific conductance, temperature, and dissolved oxygen. Laboratory measurement of pH will also be conducted.

5.8 STORMWATER SEWER OUTFALL SEDIMENT SAMPLING (TASK 21)

5.8.1 Sampling Locations and Frequency

One sediment sample will be collected from the northern stormwater sewer outfall and one from the closed landfill stormwater sewer outfall to investigate the sewer line as a potential chemical migration pathway

(Figure 3.2). Samples will be collected pending the availability of sediment. Each sample will be collected from a location immediately inside the concrete pipes.

5.8.2 Sample Designation and Task Documentation

Each sediment sample collected as part of the outfall sediment sampling task will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location; (in this case the northern sewer outfall (INSO) or closed landfill sewer outfall (CLSO)); the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. Sample designations will be: OXY-INSO-1-SED and OXY-CLSO-1-SED.

These sample designations will be written on an adhesive label in indelible ink and adhered to the sample container with additional information listed in Section 6.0.

The following information specific to the task will be recorded in the field log book during the swale sampling phase:

1. Sample location
2. Date and time of sample location
3. Types and number of sample containers filled
4. Description of sampling method

5.8.3 Sampling Equipment and Procedures

Sediment sampling equipment will be limited to stainless steel hand augers and sampling trowels. Where possible, sediment samples will be collected with the sampling trowel to minimize sample agitation. Dedicated sampling trowels will be used per sample location. Tables 1, 2 and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements, and required field QC samples, respectively.

Effort will be made to collect the two sediment samples from locations immediately inside the sewer pipe using the sampling trowel only. That sample portion for VOC analysis will be collected in three 40-ml VOA vials. That sample portion for semi-VOC analysis will be collected in one, 32-ounce, wide-mouth glass bottles. That sample portion for TAL metals analysis will be collected in one 32-ounce, wide-mouth, glass bottle. The sample for TOC analysis will be collected in one 16-ounce, wide-mouth, glass bottle. The grain size analysis samples will be collected in one 32-ounce wide-mouth glass containers.

One field duplicate, analyzed for the same parameters as listed in Section 4.4.8 of the QAPP, will be collected for this sampling event according to the procedure outlined in Section 9.2.3 of the QAPP. The duplicate will be collected in a sample container identical to the field sample containers.

A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP. Field rinsate and trip blanks will be collected or contained in sample containers identical to field sample containers.

5.8.4 Sample Analysis

Section 4.4.8 of the QAPP describes the sample analyses. Color will be noted for each sample. In addition, a representative sample will be taken from each sampling location and slurried in the field, upon which measurements of the following parameters will be made of the resulting leachate: pH/Eh, specific conductance, temperature, and dissolved oxygen. Laboratory measurement of pH will also be conducted.

5.9 SCHUYLKILL RIVER SEDIMENT SAMPLING

5.9.1 Sampling Locations and Frequency

Twelve sediment samples will be collected from the Schuylkill River to investigate any impacts from the site to the river. The sediment samples will be collected during one sampling event from the four transects indicated in Figure 4-3. Each sediment sample will be collected from the river substrate directly below each surface water sample location.

5.9.2 Sample Designation and Task Documentation

Each sediment sample collected as part of the river sampling task will be assigned a sample designation according to a predetermined numbering system. The sample designation includes the following elements in an abbreviated form: the site name; the sample location, in this case the Schuylkill River; the sample number; and the sample media. The general format is as follows: site name - sample location - sample number - sample media. An example would be OXY-SR-1-SED.

These sample designations will be written on an adhesive label in indelible ink and adhered to the sample container with additional information listed in Section 5.0 of the QAPP.

The following information specific to the task will be recorded in the field log book during the swale sampling phase:

1. Sample location
2. Date and time of sample location
3. Types and number of sample containers filled
4. Description of sampling method
5. Field parameter measurements

5.9.3 Sampling Equipment and Procedures

Sediment sampling equipment will consist of the following: Ekman dredge, dedicated sampling line, 16-foot V-hull boat, dedicated stainless steel sampling trowels, and stainless steel mixing pans (2). Tables 1, 2, and 3A of the QAPP list the number of samples per sampling event, the analytical methods and sample bottle requirements and required field QC samples, respectively.

Effort will be made to collect the sediment samples from the upper 6 to 12 inches of river substrate. At each sample location the boat will be anchored at two points to maintain its position. The Ekman dredge will be lowered to the river bottom using dedicated nylon line. The sample will be collected and lifted to the surface. Samples for chemical analysis will be transferred from the dredge to the appropriate sample containers using dedicated stainless steel sampling trowels.

Those samples for VOC analysis will be collected in three 40-ml VOA vials. That sample portion for TCL semi-VOCs and pesticides/PCBs will be collected in one, 32-ounce, wide-mouth, glass bottle. That sample portion for TAL inorganics will be collected in one 32-ounce, wide-mouth, glass bottle. The sample for TOC analysis will be collected in one 16-ounce, wide-mouth, glass bottle. The grain size analysis sample will be collected in one 32-ounce, wide-mouth, glass container.

Two field duplicates, analyzed for the same parameters as listed in Section 4.4.9 of the QAPP, will be collected for this sampling event according to the procedure outlined in Section 9.2.3 of the QAPP. The duplicate will be collected in a sample container identical to the field sample containers.

A field rinsate blank will be collected each sampling day according to the procedure outlined in Section 9.2.1 of the QAPP. Trip blanks will accompany all field samples as outlined in Section 9.2.2 of the QAPP. Field rinsate and trip blanks will be collected or contained in sample containers identical to field sample containers.

5.9.4 Sample Analysis

Section 4.4.9 of the QAPP describes the sample analyses. Color will be noted for each sample. In addition, a representative sample will be taken from each sampling location and slurried in the field, upon which measurements of the following parameters will be made of the resulting leachate: pH/Eh, specific conductance, temperature, and dissolved oxygen. Laboratory measurement of pH will also be conducted.

6.0 SAMPLE CUSTODY AND HANDLING PROCEDURES

Section 5.0 of the QAPP describes all sample custody and sample handling protocols.

6.1 SAMPLE SHIPMENT PROCEDURES

During each sampling phase of the RI/FS, at the end of each sampling day, all media samples for chemical analysis will be packaged in shipping containers for overnight delivery to the analytical laboratory, Radian Corporation. Listed below are the sample packaging and shipping procedures. Table 5-4 provides a sample packaging and shipping check list.

1. Each container is checked for a properly filled out sample identification label
2. All bottles, except the VOA vials, are taped closed with electrical tape.
3. Each sample bottle is placed in a separate plastic bag, which is then sealed.
4. A large capacity cooler or specific laboratory prepared sample container will be used to ship the samples. Each cooler to be used for a sample shipment will have the drain plug taped shut (inside and out) and will have a plastic liner inserted inside. Approximately 1 to 2 inches of packing material (asbestos-free vermiculite, perlite, or styrofoam beads) will be placed in the bottom of the liner.
5. Sample bottles will be placed in the shipping container securely, using packing material as required.
6. Aqueous samples for organic and inorganic analyses will be shipped cooled to 4°C. Either ice or freezer packs will be used to cool the samples. The ice or freezer packs will be placed between the cooler and the liner to assure sample containers remain dry during shipping.
7. Soil/sediment samples will not be shipped with ice except those samples to be analyzed for cyanide. Cyanide samples will be packaged in a separate container and cooled to 4°C.
8. After all sample containers are packed, the inner liner will be taped closed. Packing material is added as required to fill void space.

9. The chain-of-custody record going to the laboratory will be placed in a plastic bag, sealed, and taped to the inside of the lid. See previous section for information entering procedures.
10. The cooler or shipping container cover is taped closed with strapping tape.
11. Two, signed and dated custody seals will be placed across the edge of the shipping container cover, one in the front and one in the back.
12. The cooler will then be handed over to the courier with the required hand bill signed and dated.

7.0 WASTE HANDLING AND DISPOSAL

7.1 DECONTAMINATION PAD

A specific area onsite will be selected as the decontamination area for all heavy equipment and sampling tools that are not cleaned at the boring or well site. This decontamination area will either be an existing paved (concrete or asphalt) area that either drains to a sanitary sewer, or that can be modified to drain to a sump, or will be constructed from plastic liner covered with stone that drains to a sump.

7.2 SEDIMENT SETTLING BASINS

Each borehole drilled for the RI/FS will be drained to a two tier sediment settling basin system dug by a back hoe adjacent to each borehole. Each basin will be approximately 5 feet square by 6 feet deep. The second basin will be 2 to 3 feet from the first, with a shallow channel connecting the basins. One continuous sheet of plastic will be used to line both basins. A V-notch weir will be installed in the shallow channel. Sediment forced out of the borehole will settle in the first pit, with water flow between the two pits measured with the weir. Water will be removed from the second basin via a gas powered centrifugal pump. Settled drill cuttings, will be periodically removed to drums for later characterization and disposal.

7.3 EQUIPMENT DECONTAMINATION

7.3.1 Cleaning Materials

Laboratory grade detergent will be a standard brand of phosphate-free detergent such as Alconox or Liquinox. Standard cleaning solvents will be pesticide-grade methanol and hexane. Tap water will be taken from an onsite hydrant, with the water supplied by the local municipal water treatment system. Distilled, deionized, organic-free water will be used as the final water rinse.

7.3.2 Required Decontamination Procedure

Sampling equipment will be decontaminated prior to and throughout field use according to the following procedure:

1. Wash and scrub with a low phosphate detergent
2. Tap water rinse
3. Rinse with 10-percent HNO_3 , ultrapure

4. Tap water rinse
5. Methanol followed by hexane rinse (pesticide grade)
6. Air dry
7. Deionized demonstrated analyte-free water rinse

If samples for metals analysis are not being collected, the nitric acid rinse may be omitted. Decontamination water will be periodically transferred to the onsite PVC sludge clarifier.

7.3.3 Miscellaneous Equipment Cleaning Procedures

All drilling equipment that comes into contact with the soil must be steam/hot water washed before use and between sampling locations. This includes, drilling rigs (back end), drill rods, bits and augers, dredges, backhoes, support trucks or any other large equipment. Sampling devices, such as split-spoons, must be decontaminated between boreholes according to the procedure stated in Section 4.1.2. Purging pumps and water level probes will be cleaned with low phosphate detergents, followed by tap water rinse, then deionized, organic free water rinses. No acids or solvent rinses will be performed to avoid deterioration of select pump parts. Purging pumps used for well development will be decontaminated at the designated area. Purging pumps and water level probes used for well sampling will be cleaned at the well. Bailers will be segregated between wells with suspect high ppm volatile concentrations and low ppb volatile concentrations and will be cleaned according to the procedure outlined in Section 4.1.2.

7.4 GROUNDWATER HANDLING

The following activities will bring groundwater with potentially low milligrams per liter (mg/l) VOC concentrations to the surface for subsequent containment and disposal:

1. Drilling and development of reconnaissance boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1 and PW-7.
2. Packer testing of reconnaissance boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1 and PW-7.
3. Monitoring well drilling and construction:
 - a. Well development of monitoring wells TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1 and PW-7 if completed shallow (less than 150 feet BGS)

- b. Drilling and development of additional boreholes located adjacent to the former TCE handling area and the development of shallow wells (less than 150 feet) completed in those boreholes.

4. Monitoring well sampling:

- a. Purging of shallow wells (less than 150 feet) in the vicinity of the former TCE handling area

Groundwater brought to the surface during the course of execution of the above listed tasks will be pumped into either a single tanker truck or a set of two trucks, depending on the rate at which groundwater is brought to the surface. The water will then be periodically transported to either the onsite PVC clarifier or noncontact cooling water clarifier, depending on which treatment system is better suited to accept the variable volume and turbidity of the water throughout each of these tasks.

During drilling of reconnaissance boreholes TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7, TB-8, TB-9, TB-10, PW-1 and PW-7, water will be pumped from the second sediment settling basin via an adequately rated centrifugal pump into the tanker truck(s). During packer testing of these boreholes, the down hole submersible pump discharge piping will be routed directly to the tanker(s). Additional monitoring wells drilled, installed and developed in the former TCE handling area will have water collected and pumped from a similar sediment settling basin system, or, in the case of development, will have water pumped directly from the well to the tanker(s). Purge water generated during sampling of monitoring wells in the former TCE handling area will either be drummed or pumped to a tanker depending on the volume of water to be pumped.

8.0 SITE SUPPORT

Onsite facilities will be used wherever possible to expedite execution of the investigation field work. Permits for all site activities will be obtained from OxyChem plant personnel prior to execution of any field work. Electricity will come from site AC sources or from portable AC/DC generators. Water needed for decontamination or drilling will come from the local municipal water treatment system. An area onsite will be designated as the site operations area where the site office trailer and all heavy equipment and supplies will be stored throughout the course of field work. This area may or may not be associated with the designated decontamination area. The office trailer will be for coordination of all field tasks and associated personnel and will act as a staging or storage area for all record keeping, sample packaging, monitoring equipment and consumable equipment.

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TABLES

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TABLE 3-1
DEEP RECONNAISSANCE
BOREHOLE COMPLETION DEPTHS
OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

Well Identifier	Proposed Completion Depth (feet below ground surface)
TB-1	500
TB-2	500
TB-3	500
TB-4	450
TB-5	450
TB-6	450
TB-7	350
TB-8	350
TB-9	300
TB-10	350
PW-1	550
PW-7	350

TABLE 3-2

DEEP RECONNAISSANCE BOREHOLE PACKER TESTING EQUIPMENT

OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

-
1. Two inflatable rubber packers for 8-inch diameter wells
 2. Nitrogen bottles for packer inflation
 3. Three pressure transducers (with spares)
 4. Digital data logger and portable computer
 5. 1 Horsepower submersible pump (with spare)
 6. System control box (with spare)
 7. Pump control - off/on starter, breaker
 8. Pressure regulator for each packer
 9. Transducer power supply for three transducers
 10. System reel
 11. Pump power cable
 12. Inflation tubes
 13. Transducer cables and quick connects
 14. Covers and heat for cold weather
 15. Galvanized, 1-1/4 inch lift pipe
 16. Battery operated printer
 17. Well head sampling and flow control assembly
 18. Generator (with spare)
 19. Elevators, pump support and pump hoist
 20. Water level meter
-

TABLE 3-3
MONITORING WELLS FOR GROUNDWATER SAMPLING

OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

Well Identifier	Monitored Zone
OW-9	Alluvium
OW-10	Alluvium
OW-11	Alluvium
OW-12	Alluvium
OW-16	Alluvium
OW-17	Alluvium
OW-19	Alluvium
OW-20	Alluvium
OW-21	Alluvium
OW-25	Alluvium
OW-8A	Shallow Bedrock
OW-24A	Shallow Bedrock
OW-27A	Shallow Bedrock
BR-1	Shallow Bedrock
BR-2	Shallow Bedrock
BR-3	Shallow Bedrock
TB-1	Shallow to Deep Bedrock
TB-2	Shallow to Deep Bedrock
TB-3	Shallow to Deep Bedrock
TB-4	Shallow to Deep Bedrock
TB-5	Shallow to Deep Bedrock
TB-6	Shallow to Deep Bedrock
TB-7	Shallow to Deep Bedrock
TB-8	Shallow to Deep Bedrock
TB-9	Shallow to Deep Bedrock
TB-10	Shallow to Deep Bedrock
PW-1	Shallow to Deep Bedrock
PW-7	Shallow to Deep Bedrock
6 additional bedrock wells	Shallow to Deep Bedrock
Total: 34	



TABLE 3-4
MONITORING WELL SAMPLING EQUIPMENT

OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

Well Purging Equipment

1. Submersible pump
2. Centrifugal pump
3. PVC bailer and dedicated line
4. Polyethylene water discharge tubing
5. Plastic ground cover
6. Container and stop watch

Sampling Equipment

1. Teflon bailer
2. Dedicated teflon coated steel bailer line
3. Nitrogen pressure filter
4. Specific conductance meter
5. pH meter
6. Temperature meter
7. Plastic ground cover

Decontamination Equipment

1. Pressurized deionized water sprayer
 2. Bristle brush
 3. Wash bucket
 4. Aluminum foil
-

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TABLE 3-5

AQUIFER PUMPING TEST OBSERVATION EQUIPMENT

OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

-
1. Hermit 2 (1000B) and 8 (2000) channel data loggers (or equivalent)
 2. Pressure transducers (10 psi to 50 psi)
 3. Transducer extension cables
 4. Transducer/Datalogger interface cables
 5. Electric water level probes
 6. Production pump on/off time recorder (for PW-6 and PW-9)
-

TABLE 5-1
SOIL VAPOR SURVEY EQUIPMENT
OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

-
1. Photovac 10S50 portable gas chromatograph fitted with an isothermal capillary column (CPSIL5)
 2. Wellpoint sampling equipment
 3. 2.5-foot long, 5/8-inch outside diameter (O.D.) hardened, hollow steel sampling probes
 - a. Threaded, hollow, hardened steel probe connectors
 - b. Lift-jack
 - c. Disposable steel well points
 4. Electric vacuum pump fitted with silicon tubing
 5. Swagelok reducers
 6. Rotary hammer drill
 7. Gas-tight glass syringes
-

TABLE 5-2
SOIL BORING AND SAMPLING EQUIPMENT
OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

-
1. Rotary drilling rig equipped with 4-1/4-inch hollow stem augers
 2. 2-inch and 3-inch (O.D.) split-barrel samplers
 3. Stainless steel sampling trowel
 4. Hnu Photoionization Detector
-



TABLE 5-3
LINED LAGOONS BORING AND SAMPLING EQUIPMENT
OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

-
1. Rotary drilling rig equipped with 4.25-inch hollow stem augers
 2. 2-inch and 3-inch (O.D.) split-barrel samplers
 3. Backhoe
 4. Stainless steel hand auger
 5. Stainless steel sampling trowel
-

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TABLE 5-4
SAMPLE HANDLING AND SHIPMENT CHECKLIST
OCCIDENTAL CHEMICAL CORPORATION
POTTSTOWN, PENNSYLVANIA

Environmental Samples

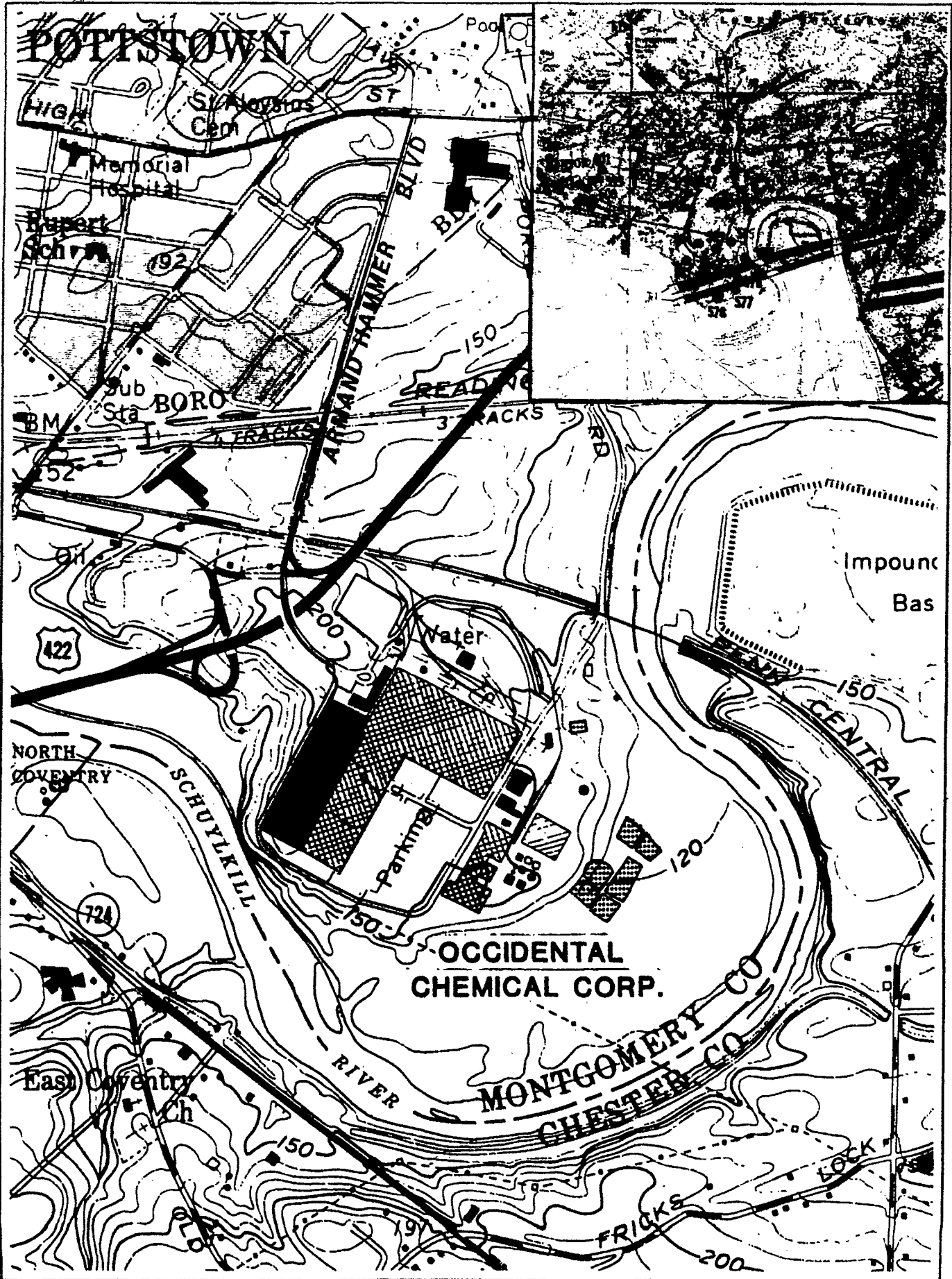
1. Proper preservatives are added
2. Tags placed on bottles
3. Bottles placed in plastic bag
4. Bottles placed in cooler
5. Separators placed in cooler, ice added
6. Cooler filled with vermiculite
7. Paperwork taped to inside top of cooler
8. Cooler sealed with tape and custody seals
9. Cooler properly labeled
10. Samples shipped (regular airbill)

Source: A Compendium of Superfund Field Operations Methods
(EPA/540/P-87/100)

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FIGURES

AR301358



Source: USGS Quadrangle, Phoenixville, PA

0 1000ft.



- Lockatong Formation
- Brunswick Formation
- Diabase

Figure 1.1
Site Location and Geologic Map

AR301359

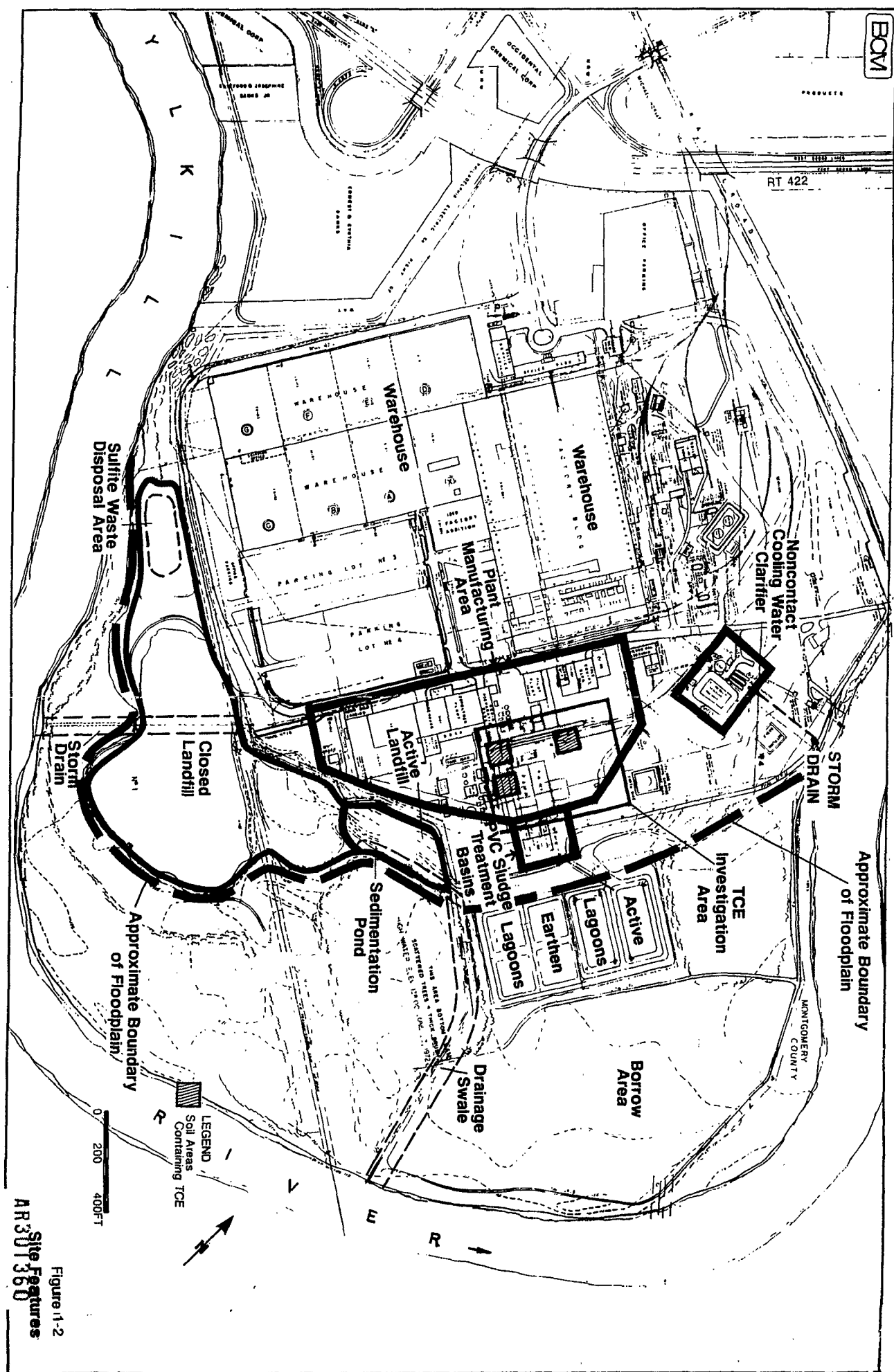


Figure 1-2
Site Features
AR301360

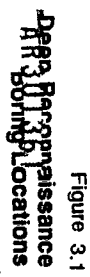


Figure 3.1

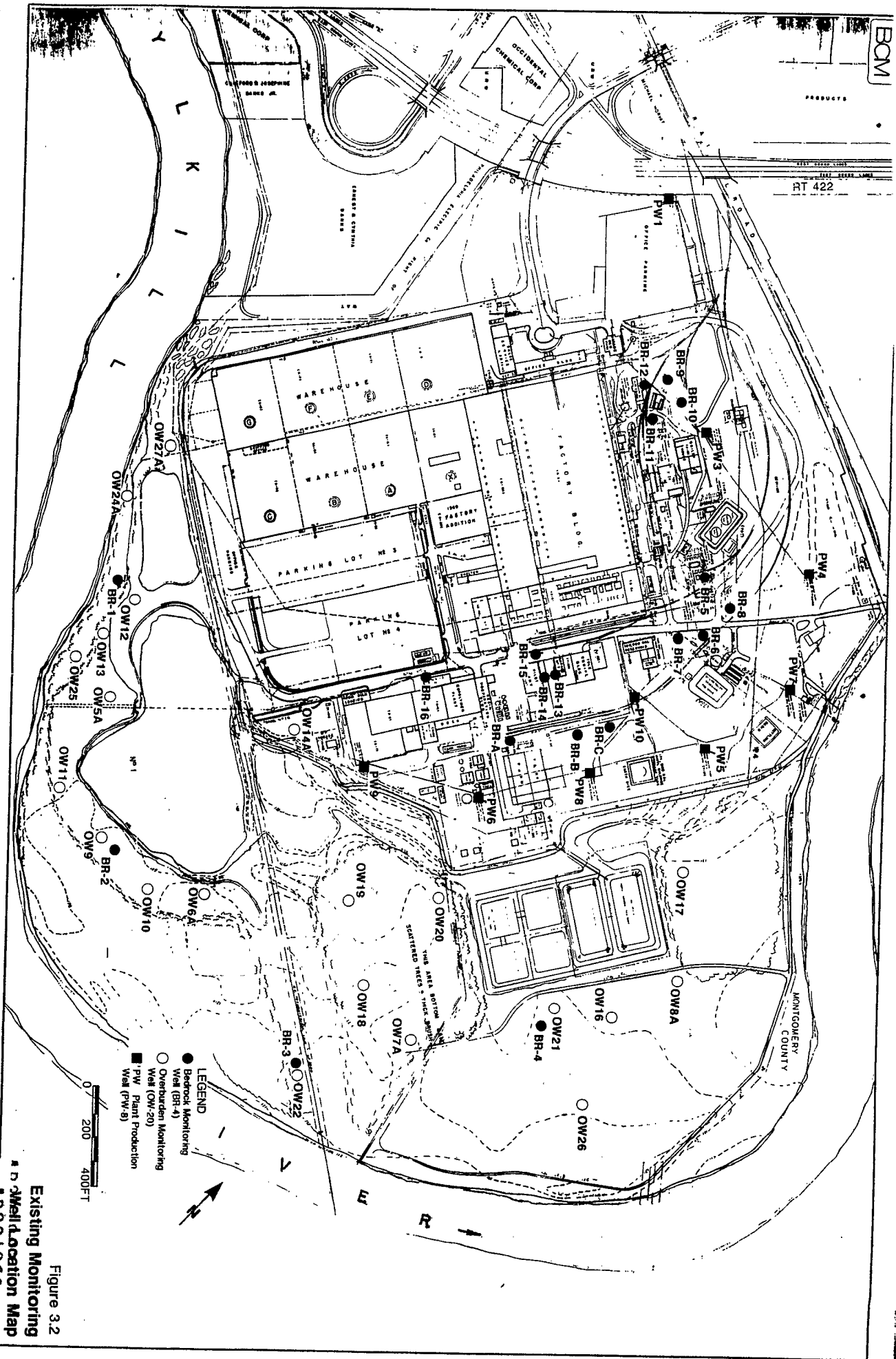
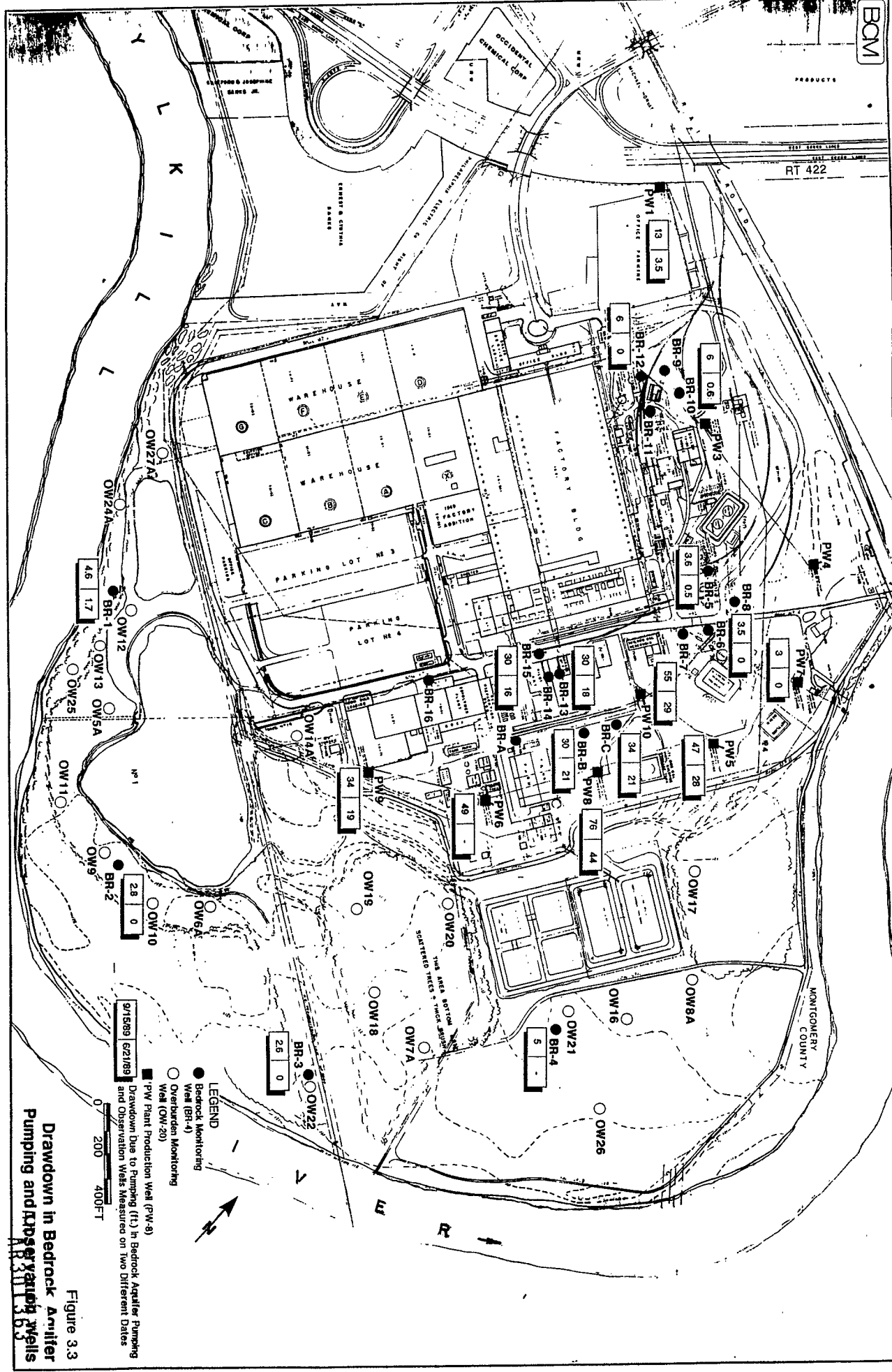
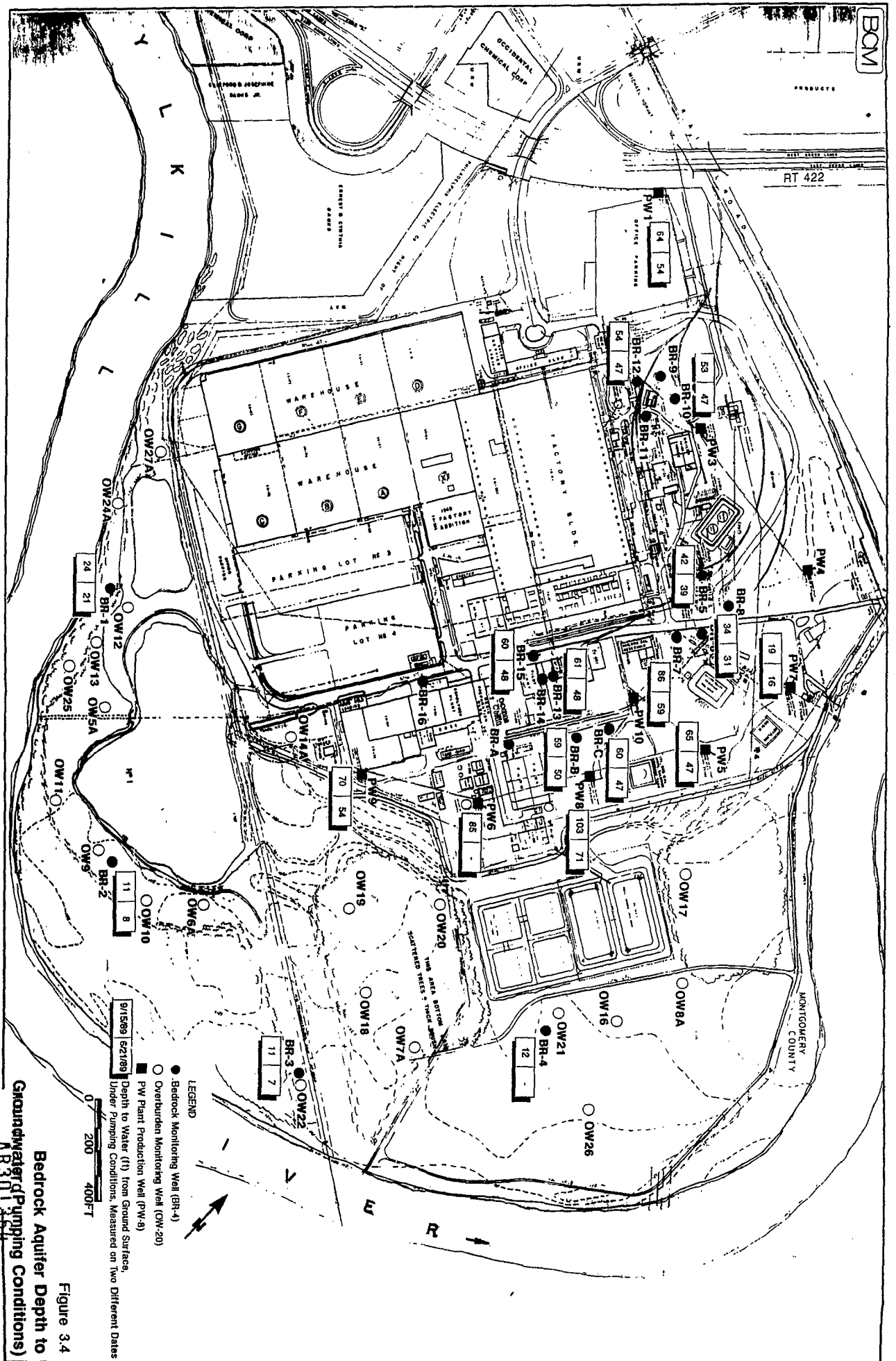
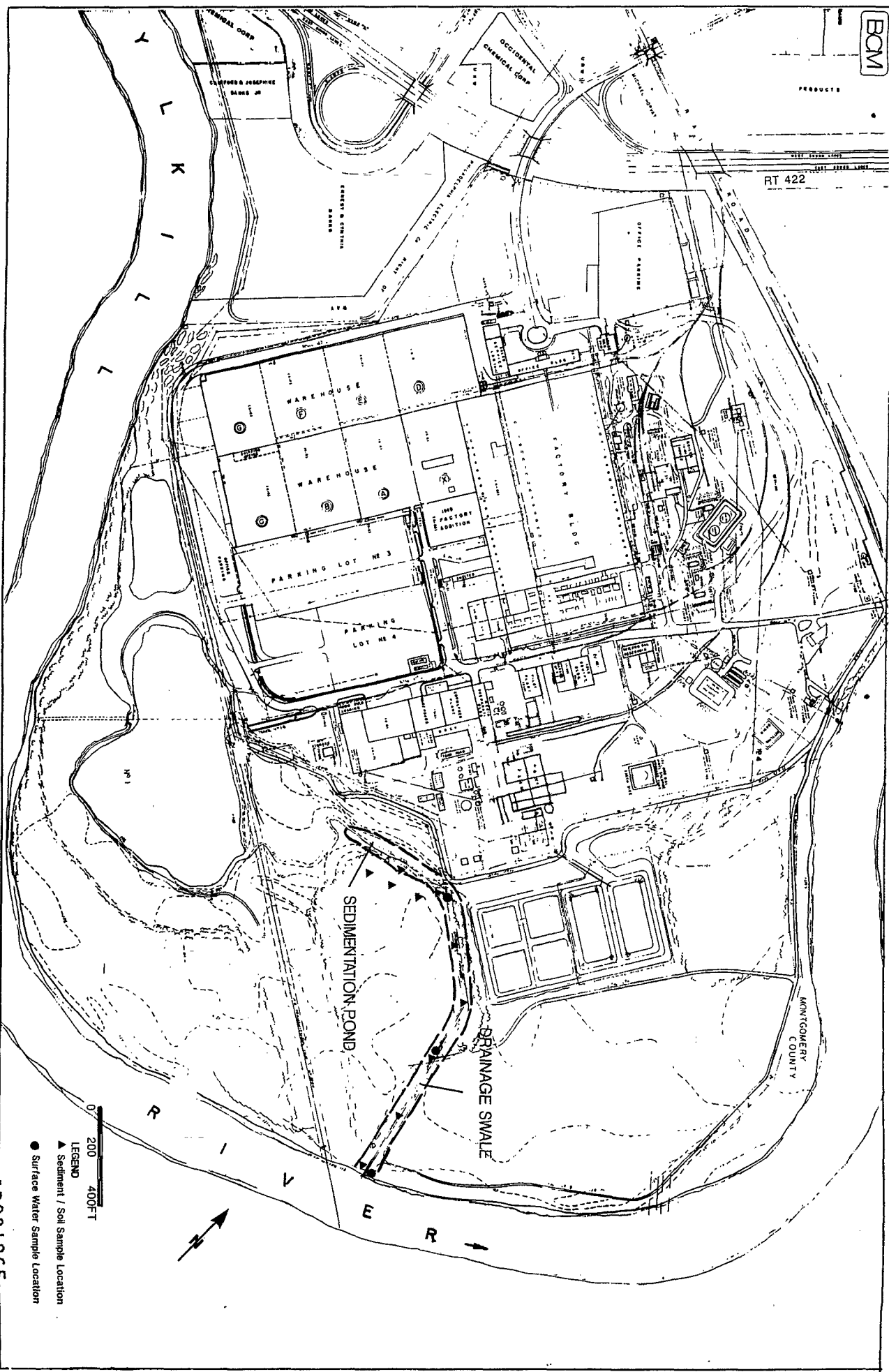


Figure 3.2
Existing Monitoring
Well Location Map
AR301362







Swale Sediment and Surface Water Sampling Locations

AR301365 Figure 4.1

HR 301366

Storm Sewer

Surface Water and Sediment Sampling Locations



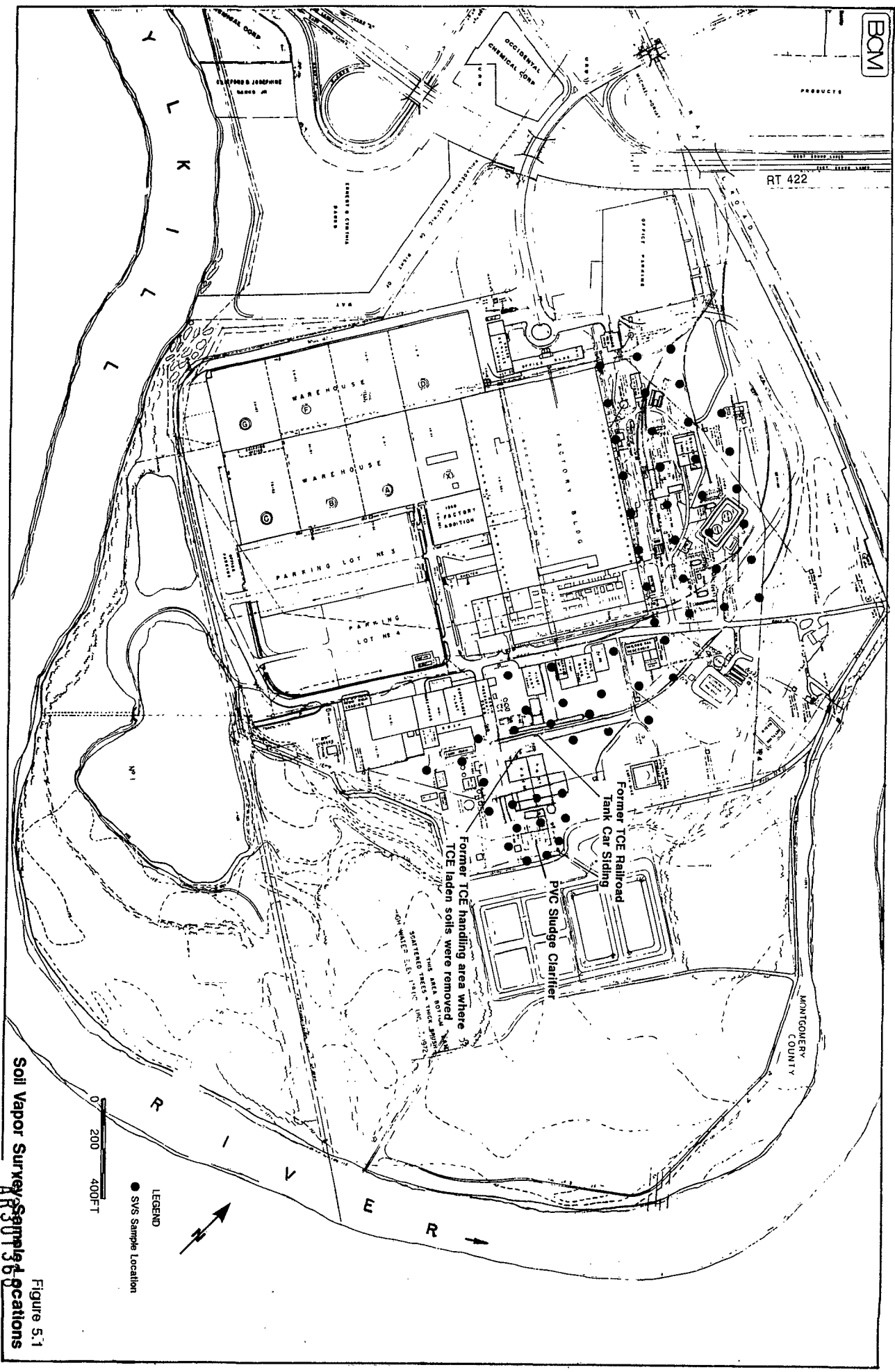
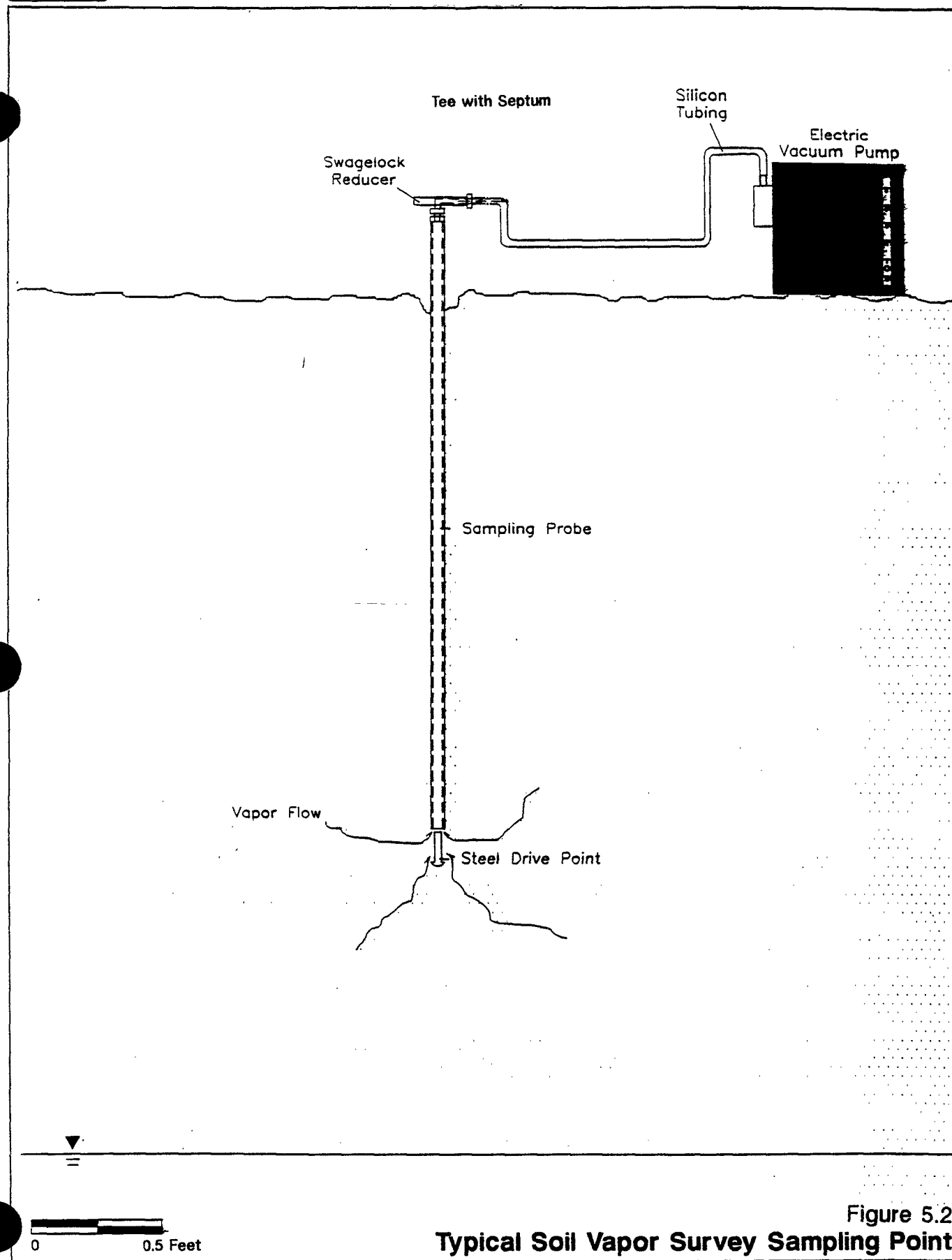
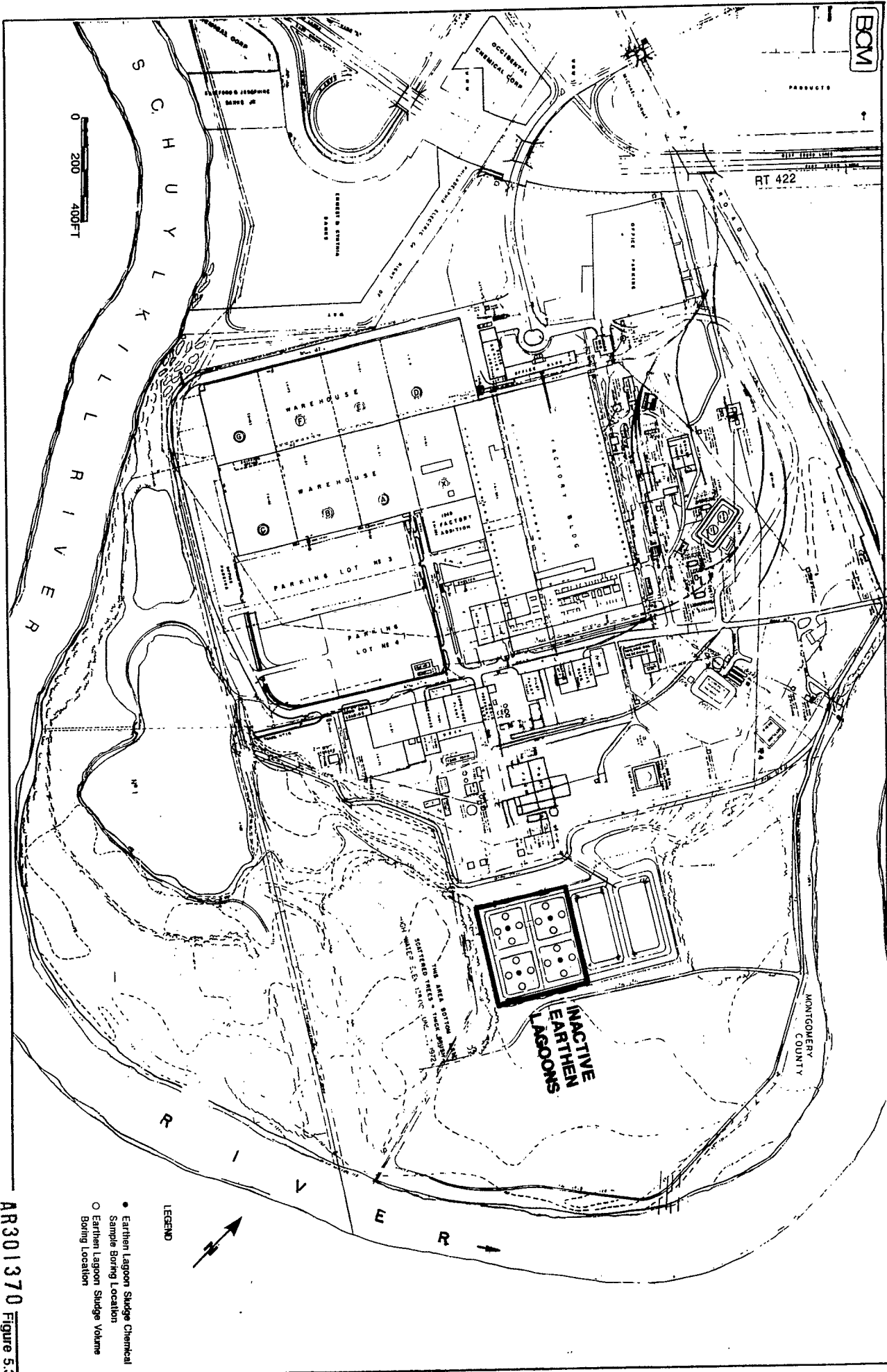


Figure 5.1
Soil Vapor Survey Sample Locations
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AR301370 Figure 5.3
Inactive Earthen Lagoons Sampling Locations

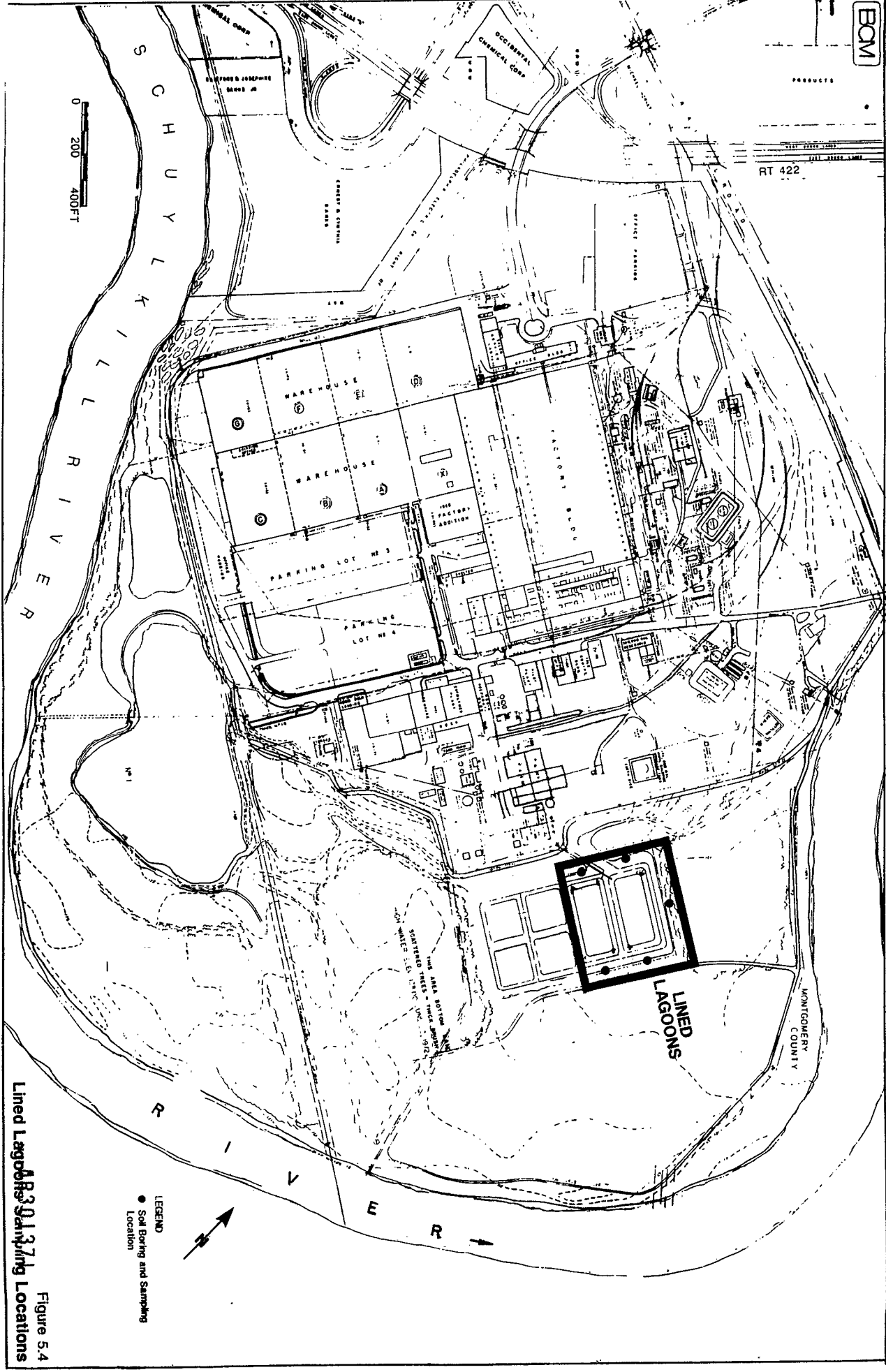
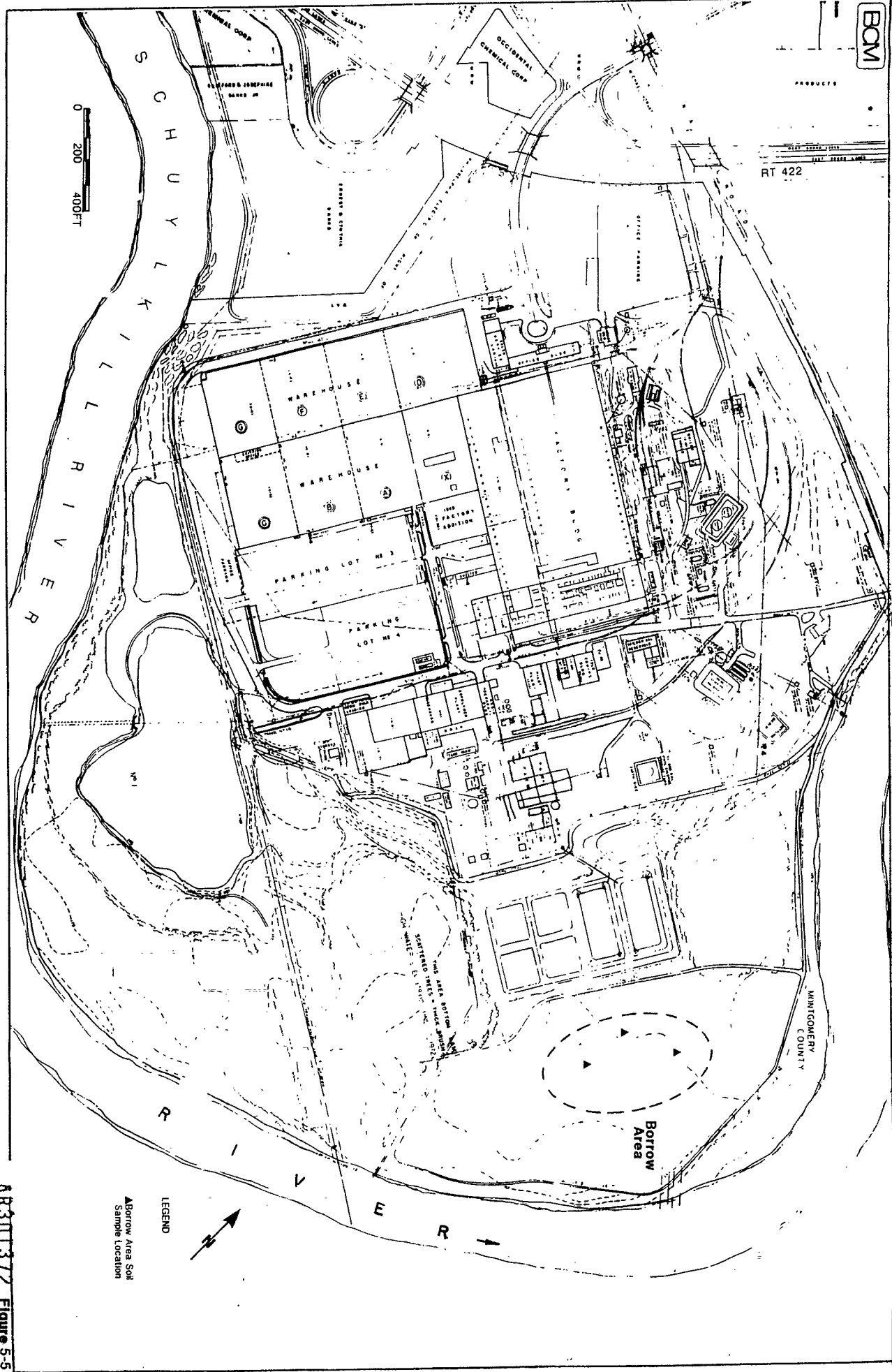


Figure 5.4
Lined Lagoons Sampling Locations

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AR301372 Figure 5-5
Borrow Area Soil Sampling Locations